

ORDINANCE

FOR

**BACHELOR OF SCIENCE IN MEDICAL RADIOLOGY &
AND IMAGING TECHNOLOGY**



(THIS ORDINANCE HAS BEEN APPROVED IN THE MEETING OF
BOARD OF STUDIES HELD ON DATED 10th August, 2022)

APPLICABLE W.E.F. ACADEMIC SESSION 2022-2023



SRI HARGOBINDGARH, PHAGWARA – HOSHIARPUR ROAD,
PHAGWARA 144401, PUNJAB

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BACHELOR OF SCIENCE IN MEDICAL RADIOLOGY AND IMAGING TECHNOLOGY

SHORT TITLE AND COMMENCEMENT

I. This ordinance shall be called the ordinance for the Bachelor of Science in Medical Radiology and Imaging Technology of GNA University, Phagwara.

II. This ordinance shall come into force with effect from academic session 2022-23.

1. Name of Program: Bachelor of Science in Medical Radiology & Imaging Technology

2. Name of Faculty: Faculty of Allied & Healthcare Sciences

3. Vision of the Department: The Vision of the department of Medical Radiology & Imaging Technology of GNA University is to produce a well- educated & Highly Skillful Manpower for Hospitals who can work in Radiology Department. The department stands beside the university mission in contributing towards the world having the best higher education system with transformative & innovative education. The Vision is to create a highly skillful & trained personals who can work in differentfields to benefit our society & help in creating a Healthy World.

3.1 Mission of the Department:

M1: Having a revolutionary impact on students by focusing on deep inter-disciplinary knowledge, getting technical as well as Theoretical concept of Radiology, focusing on leadership, communication and interpersonal skills, personal health and well-being.

M2: Creating best of educational experience by engaging with partners outside the traditional borders of University campus. By engaging in a network of Hospitals & other Healthcare providing facilities to create a job oriented.

M3: Cultivating productive community by attracting and retaining diverse, best talent and such an environment where research, innovation, creativity and entrepreneurship can flourish.

M4: To give students the best knowledge by the most innovative methods and also provide hospital exposure to work on Radiology Equipment & know about their functioning & maintenance.

4. Program Educational Outcomes (PEOs):

PEO1: Students will demonstrate the ability to properly operate imaging equipment.

PEO2: Students will determine proper exposure factors to obtain diagnostic quality radiographs.

PEO3: Students will demonstrate proper positioning skills.

PEO4: Students will demonstrate knowledge of radiation protection principles.

PEO5: Students will demonstrate written communication skills.

PEO6: Students will provide quality patient care.

PEO7: Students will apply critical thinking skills in the practice of diagnostic radiography.

PEO8: Students will effectively analyze/critique radiographic images for diagnostic quality.

PEO9: Students will demonstrate professional behavior and values

4.1 Program Outcomes:

PO1: The Students who will Complete this Program will be able to have a lifelong knowledge of all the Equipment's used in it along with basic science knowledge

PO2: Radiology is a new stream in Allied Sciences & there is a Major need of these professionals. Thus, Creating a vast employability option.

PO3: Radiology Technicians/Assistants will work in Radiology & Operation Theatres etc. Along with Radiologist & thus will be having a great & Important role in hospital & ensuring their sustainability.

PO4: By choosing this stream, the Students will get to know about the equipment's & Machines used in Radiology & will be able to operate all modern Radiology Equipment's

PO5: This program will ensure overall professional development of students & in their behavior & manners too.

PO6: This Program can do an overall development of the student to be able to have all the technical aspects about Radiology & Basic Sciences

5. Program specific Outcomes:

PSO1: Ability to analyze, Monitor & Examine the patient.

PSO2: Understand the fundamentals and applications of Radiology & Emergency Care Equipment's.

PSO3: Ability to have knowledge of BLS & ACLS and ability to deliver it whenever required.

PSO4: Ability to Assist a Radiologist in diagnosing various diseases with the help of imaging.

PSO5: Able to detect any Changes in patient's physiological status & able to tackle all types of Complications.

6. General Regulations for Faculty of Allied & Healthcare Sciences:

i) The University may introduce programs under Faculty of Allied & Healthcare Sciences which are specified under the UGC Act 1956. The Governing Body may approve the introduction, suspending or phasing out a program on the recommendation of the Academic Council either on its own or on the initiative of faculty.

ii) The admissions to a Faculty of Allied & Healthcare Sciences programs shall be generally governed by the rules of the UGC or any other competent authority of the MHRD or as approved by Governing Body of University and shall be as notified in the admission notification of the respective academic year.

iii) The minimum entry qualification for admission to the students of Faculty of Allied & Healthcare Sciences shall be such as may be laid down in the regulations or specified by the Governing Body like MoHFW.

iv) Minimum qualification for admission to the first year program of Faculty of Allied & Healthcare Sciences shall be the Senior Secondary School Certificate (10+2) in any stream recognized from any board/ institution/ university. While deciding the admission procedure, the University may lay down compulsory subjects in qualifying examination for admission for various programs in the admission policy.

v) A student shall be required to earn a minimum number of credits through various academic components of a curriculum, as provided for in the regulations.

vi) A student shall be required to complete all the requirements for the award of the degree with in such period as may be specified in the regulations.

vii) A student may be granted such scholarship as may be specified in accordance with the directions of the Governing Body from time to time or regulations laid down for the same.

viii) A student admitted to the programs shall be governed by the rules, regulations and procedures framed and implemented by the University from time to time.

ix) The students shall abide by the regulations mentioned in student handbook issued by the University. These standing regulations shall deal with the discipline of the students in the Hostels, Faculty, and University premises or outside. The standing orders may also deal with such other matters as are considered necessary for the general conduct of the students' cocurricular and extra-curricular activities.

x) In exceptional circumstances the chairman of Academic Council may, on behalf of the Council, approve amendments, modifications, Insertions or deletions of an Ordinance(s) which in his/her opinion is necessary or expedient for the smooth running of the program provided all such changes are reported to the Council in its next meeting.

7. General Regulations for the Medical Radiology & Imaging Technology:

Short Title and Commencement: These regulations shall be called regulations for the Bachelor program in Faculty of Allied & Healthcare Sciences of the University and shall come into force on such date as the Academic Council may approve.

Duration: The duration of the Bachelor program leading to Bachelor of Medical Radiology & Imaging Technology shall be minimum of three years and maximum of four years for honors course and each year will comprise of two semesters. However, the duration may be extended up-to five years from the registered batch for Bachelors course and the duration may be extended up-to six years from the registered batch for the honors course. The maximum duration of the programs excludes the period of withdrawal, due to medical reasons. However, it shall include the period of rustication or any other reason of discipline /academics e.g., detention, willful absence by the student, not getting promotion to the next class due to poor academic performance etc. Under detention, the student shall attend the University for an additional semester or more time, as equated to period of absence/suspension.

Starting or phasing out of Program: The University may order such Undergraduate programs in Faculty of Allied & Healthcare Science leading to award a bachelor of degrees of Medical Radiology & Imaging Technology as per nomenclature laid by the UGC regulations, MoHFW on the subject. A program may be phased out on recommendations of the Academic Council and approval of the Governing Body, on account of continuous low registration in the program or any other justifiable reason like becoming obsolete etc. Similarly, the Academic Council may

approve starting of a new program or modifying the existing one on the recommendations of the Academic Council.

Admissions: Admission to Medical Radiology & Imaging Technology program shall be made as per procedure approved by the Governing Body and may be reviewed periodically as required. Fee structure, refund policy, total number of seats, reservation policy, and special category seats, e.g. sponsored seats, or direct into II year through lateral entry scheme for those who have completed Diploma in Medical Radiology & Imaging Technology.

Eligibility for Admission: 10+2 in Medical with 50% (45 % for SC/ST/OBC) marks in aggregate from any recognized board. It is compulsory for the students of 10+2 in Non-Medical stream to pass Deficiency Course i.e. Basic Biology (BIO000) * subject in 1st Year (Preferably in 1st SEM) or student has to clear/produce 10+2 Biology from their respective recognized board.

*A separate certificate will be issued for the same.

Lateral entry: 10th with three-year diploma in Medical Radiology & Imaging Technology will be eligible for admission in second year/3rd semester (or) 10+2 in Medical with two years diploma in Medical Radiology & Imaging Technology be eligible for admission in second year/3rd semester.

Semester System: The Bachelor of Medical Radiology & Imaging Technology program in the University shall be based on Semester System; namely, Even (Jan to June) and Odd (July to Dec) Semesters, in an academic year. The courses whether ordered in regular semester shall be evaluated as per the policy and procedure laid down.

Semester Duration: A semester will be of approximately 18-20 weeks' duration. Of these, 90 days will be available for actual instructions including Mid Semester Exam.

8. Curriculum:

The 3-year curriculum has been divided into six semesters and shall include lectures/ tutorials/ laboratory work/ field work/ outreach activity/ project work/ viva/ seminars/ presentations/ assignments etc. or a combination of some of these. The curriculum will also include other curricular, co-curricular and extra-curricular activities as may be prescribed by the university from time to time.

***B.Sc. (Honors) Medical Radiology & Imaging Technology: A student can opt honors course by studying 4th year which comprises of core courses, research project & internship.**

9. Choice Based Credit System:

The University has adopted Choice Based Credit System (CBCS), which provides an opportunity to the students to choose courses from the offered courses comprising of Core Course, Ability Enhancement, and Audit Courses. The choice-based credit system provides a “flexible” approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses, and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Following are the types of courses and structure for the program.

Courses:

I. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement to complete the requirement of program in as a discipline of study.

Note: A core course ordered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective. Elective Course(s) may also be called an “Open Elective”

a) Ability Enhancement Courses (AEC): The Ability Enhancement Courses (AEC) may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC).

i. Ability Enhancement Compulsory Courses (AECC): “AECC” courses are the courses based upon the content that leads to Knowledge enhancement. These are mandatory for all disciplines i.e., (i) Environmental Studies, and (ii) English Communication/MIL Communication.

ii. Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge and are aimed at providing hands-on-training, competencies, skills, etc.

iii. Deficiency Course (DC): This course i.e. Basic Biology (BIO000) is compulsorily be studied by the candidates of 10+2 Non-Medical stream.

10. Medium of Instructions:

The medium of instructions and examination will be English.

Practical work/Project Work / Project Report / Dissertation / Field Work Report / Training Report etc., if any, should be presented in English.

11. Mode: The program is offered in 'Full Time' mode of study only.

12. Attendance Requirement to be Eligible to Appear in End Semester Examination:

Every student is required to attend at least 75% of the lectures delivered squaring tutorials, practical and other prescribed curricular and co-curricular activities.

Dean of Faculty may give a further relaxation of attendance up to 10% to a student provided that he/she has been absent with prior permission of the Dean of the Faculty for the reasons acceptable to him/her. Further, relaxation up to 5% may be given by the Vice Chancellor to make a student eligible under special circumstances only.

No student will be allowed to appear in the end semester examination if he/she does not satisfy the attendance requirements. Further, the attendance shall be counted from the date of admission in the University or commencement of academic session whichever is later. Attendance of N.C.C/N.S.S. Camps or Inter-Collegiate or Inter-University or Inter-State or International matches or debates or Educational Excursion or such other Inter-University activities as approved by the authorities' involving journeys outside the city in which the college is situated will not be counted as an absence. However, such absence shall not exceed four weeks per semester of the total period of instructions. Such type of facility should not be availed twice during the study.

13. Credit: Each course, except a few special audit courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and/or laboratory contact hours in a week. A letter grade, corresponding to specified number of grade points, is awarded in each course for which a student is registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average. A minimum number of credits should be acquired to qualify for the programs.

Earned Credits (EC): The credits assigned to a course in which a student has obtained 'D'

(minimum passing grade) or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained F, or W or "I" grade will not be counted towards his/her earned credits.

A unit by which the course is measured. It determines the number of hours of instruction required per week.

Contact Hours per Week	Credit Assigned
1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

13. Program Structure: As per GNA University

SEM	Course	Theory & Tutorial (No. × Credits)	Practicals (No. × Credits)	Total Credits / Semester
I & II	Core Courses	4 × 4 = 16	5 × 2 = 10	45
		4 × 3 = 12	3 × 1 = 03	
	Ability Enhance Compulsory Courses (AECC)	2 × 2 = 04		
Exit Program as certificate course		32	13	45
III & IV	Core Courses	7 × 4 = 24	6 × 2 = 12	44
		1 × 3 = 03	1 × 1 = 01	
Exit Program as Diploma course		59	26	89
V & VI	Core Courses	4 × 4 = 16	2 × 2 = 04	48
	Skill Enhanced	1 × 3 = 03		
	Internship	1 × 25 = 25		
Exit Program as Degree Course		103	30	137
VII & VIII	Core Courses	4 × 4 = 16	1 × 2 = 02	51
	Skill Enhanced Courses	1 × 3 = 03		
	Research Project		1 × 4 = 04	
			1 × 26 = 26	
Exit Program as Degree in Honors		122	62	188
Total Course Credits				188
Deficiency Course (DC) Basic Biology (BIO000)		1 × 3 = 03		03

Semester	Core Course (CC)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (4) Skill Based	Discipline Specific Elective (DSE) (6)
I	CC 1	AECC 1		
	CC 2			
	CC 3			
	CC 4			
II	CC 5	AECC 2		
	CC 6			
	CC 7			
	CC 8			
III	CC 9			
	CC 10			
	CC 11			
	CC 12			
IV	CC 13			
	CC 14			
	CC 15			
	CC 16			
V	CC 17		SEC – I	
	CC 18			
	CC 19			
VI	Major Internship (6 months)			
IV	CC 20		SEC – II	
	CC 21			
	CC 22			
	CC 23			
VII	Research Project			
	Major Internship (6 months)			
IX	DC (BIO000)			

Bachelor of Science in Medical Radiology & Imaging Technology

Sr. No.	Category Type	Course Code		Course Name
1.	Core	RIT101	Core	HUMAN ANATOMY AND PHYSIOLOGY I
2.	Core	RIT102	Core	BASICS PHYSICS INCLUDING RADIOLOGICAL PHYSICS
3.	Core	RIT103	Core	CONVENTIONAL RADIOGRAPHY AND EQUIPMENT
4.	Core	RIT104	Core	RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES
5.	Core	RIT201	Core	ANATOMY AND PHYSIOLOGY II
6.	Core	RIT202	Core	CLINICAL RADIOGRAPHY- POSITIONING PART I
7.	Core	RIT203	Core	MODERN RADIOLOGICAL &IMAGING EQUIPMENT INCLUDING PHYSICS
8.	Core	RIT204	Core	CONTRAST AND SPECIAL RADIOGRAPHY PROCEDURES
9.	Core	RIT301	Core	PHYSICS OF NEWER IMAGING MODALITIES
10.	Core	RIT302	Core	CLINICAL RADIOGRAPHY- POSITIONING PART II
11.	Core	RIT303	Core	NEWER MODALITIES IMAGING TECHNIQUES INCLUDING PATIENT CARE
12.	Core	RIT304	Core	QUALITY CONTROL IN RADIOLOGY AND RADIATION SAFETY
13.	Core	RIT401	Core	CROSS SECTIONAL ANATOMY AND PHYSIOLOGY
14.	Core	RIT402	Core	PHYSICS OF ADVANCED IMAGING TECHNOLOGY
15.	Core	RIT403	Core	RADIOGRAPHIC TECHNIQUES OF ADVANCED IMAGING TECHNOLOGY
16.	Core	RIT403	Core	REGULATORY REQUIREMENTS IN DIAGNOSTIC RADIOLOGY & IMAGING, ACT AND RULES, REGULATIONS FOR JCI, NABH, NABHR
17.	Core	RIT501	Core	QUALITY ASSURANCE & RADIATION SAFETY (AERB GUIDELINES) IN DIAGNOSTIC RADIOLOGY
18.	Core	RIT502	Core	NUCLEAR MEDICINE
19.	Core	RIT503	Core	RESEARCH METHODOLOGY AND BIOSTATISTICS
20.	Core	RIT701	Core	INTERVENTION RADIOLOGICAL TECHNIQUES AND CARE OF PATIENT
21.	Core	RIT702	Core	CT PROCEDURES
22.	Core	RIT703	Core	NUCLEAR MEDICINE PHYSICS
23.	Core	RIT704	Core	MRI PROCEDURES

Core Courses Laboratory

Sr. No.	Category Type	Course Code		Course Name
1.	Core	RIT121	Core	HUMAN ANATOMY AND PHYSIOLOGY LABORATORY I
2.	Core	RIT122	Core	BASICS PHYSICS INCLUDING RADIOLOGICAL PHYSICS
3.	Core	RIT123	Core	CONVENTIONAL RADIOGRAPHY AND EQUIPMENT LABORATORY
4.	Core	RIT124	Core	RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES LABORATORY
5.	Core	RIT221	Core	HUMAN ANATOMY AND PHYSIOLOGY LABORATORY II
6.	Core	RIT222	Core	CLINICAL RADIOGRAPHY- POSITIONING PART LABORATORY I
7.	Core	RIT223	Core	MODERN RADIOLOGICAL &IMAGING EQUIPMENT INCLUDING PHYSICS LABORATORY
8.	Core	RIT224	Core	CONTRAST AND SPECIAL RADIOGRAPHY PROCEDURE LAB
9.	Core	RIT321	Core	PHYSICS OF NEWER IMAGING MODALITIES LABORATORY
10.	Core	RIT322	Core	CLINICAL RADIOGRAPHY- POSITIONING PART LABORATORY II
11.	Core	RIT323	Core	NEWER MODALITIES IMAGING TECHNIQUES INCLUDING PATIENT CARE LABORATORY
12.	Core	RIT421	Core	CROSS SECTIONAL ANATOMY AND PHYSIOLOGY LABORATORY
13.	Core	RIT422	Core	CROSS SECTIONAL ANATOMY AND PHYSIOLOGY LABORATORY
14.	Core	RIT423	Core	RADIOGRAPHIC TECHNIQUES OF ADVANCED IMAGING TECHNOLOGY LABORATORY
15.	Core	RIT424	Core	REGULATORY REQUIREMENTS IN DIAGNOSTIC RADIOLOGY & IMAGING, ACT AND RULES, REGULATIONS FOR JCI, NABH, NABHR LABORATORY
16.	Core	RIT521	Core	QUALITY ASSURANCE & RADIATION SAFETY (AERB GUIDELINES) IN DIAGNOSTIC RADIOLOGY LABORATORY
17.	Core	RIT522	Core	HOSPITAL PRACTICE & CARE OF PATIENTS LABORATORY
18.	Core	RIT001	Core	INTERNSHIP
19.	Core	RIT721	Core	INTERVENTION RADIOLOGICAL TECHNIQUES AND CARE OF PATIENT LABORATORY
20.	Core	RIT002	Core	INTERNSHIP
21.	Core	RIT003	Core	PROJECT REPORT

Bachelor of Science In Medical Radiology & Imaging Technology Semester I (First year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT101	HUMAN ANATOMY AND PHYSIOLOGY I	3	0	0	3	3	40	60	100
2	Core Course	RIT121	HUMAN ANATOMY AND PHYSIOLOGY LABORATORY I	0	0	2	1	2	30	20	50
3	Core Course	RIT102	BASICS PHYSICS INCLUDING RADIOLOGICAL PHYSICS	3	0	0	3	3	40	60	100
4	Core Course	RIT122	BASICS PHYSICS INCLUDING RADIOLOGICAL PHYSICS LABORATORY	0	0	4	2	4	30	20	50
5	Core Course	RIT103	CONVENTIONAL RADIOGRAPHY AND EQUIPMENT	4	0	0	4	4	40	60	100
6	Core Course	RIT123	CONVENTIONAL RADIOGRAPHY & EQUIPMENT LABORATORY	0	0	4	2	4	30	20	50
7	Core Course	RIT104	RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES	4	0	0	4	4	40	60	100
8	Core Course	RIT124	RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES LABORATORY	0	0	2	1	2	30	20	50
9	Ability Enhanced compulsory Course	COM-101	ENGLISH COMMUNICATION	2	0	0	2	2	40	60	100
10	Ability Enhanced compulsory Course	COM121	English Communication LAB	0	0	2	1	2	30	20	50
Total Credits				16	0	14	21	30	350	400	750

Bachelor of Science In Medical Radiology & Imaging Technology Semester II (First year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT201	ANATOMY AND PHYSIOLOGY II	3	0	0	3	3	40	60	100
2	Core Course	RIT221	HUMAN ANATOMY AND PHYSIOLOGY LABORATORY II	0	0	2	1	2	30	20	50
3	Core Course	RIT202	CLINICAL RADIOGRAPHY-POSITIONING PART I	3	0	0	3	3	40	60	100
4	Core Course	RIT222	CLINICAL RADIOGRAPHY-POSITIONING PART LABORATORY	0	0	4	2	4	30	20	50
5	Core Course	RIT203	MODERN RADIOLOGICAL &IMAGING EQUIPMENT INCLUDING PHYSICS	3	0	0	3	3	40	60	100

6	Core Course	RIT223	MODERN RADIOLOGICAL & IMAGING EQUIPMENT INCLUDING PHYSICS LAB	0	0	4	2	4	30	20	50
7	Core Course	RIT204	CONTRAST AND SPECIAL RADIOGRAPHY PROCEDURES	4	0	0	4	4	40	60	100
8	Core Course	RIT224	CONTRAST AND SPECIAL RADIOGRAPHY PROCEDURE LAB	0	0	4	2	4	30	20	50
9	Ability Enhanced compulsory Course	ENS001	ENVIRONMENTAL STUDIES	2	0	0	2	2	40	60	100
10	Deficiency Course (DC)	BIO000	BASIC BIOLOGY	3	0	0	3	3	40	60	100
TOTAL				15	0	14	22	29	320	380	700

Bachelor of Science In Medical Radiology & Imaging Technology Semester III (Second year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT301	PHYSICS OF NEWER IMAGING MODALITIES	4	0	0	4	4	40	60	100
2	Core Course	RIT321	PHYSICS OF NEWER IMAGING MODALITIES LABORATORY	0	0	4	2	4	30	20	50
3	Core Course	RIT302	CLINICAL RADIOGRAPHY-POSITIONING PART II	4	0	0	4	4	40	60	100
4	Core Course	RIT322	CLINICAL RADIOGRAPHY-POSITIONING PART LABORATORY II	0	0	4	2	4	30	20	50
5	Core Course	RIT303	NEWER MODALITIES IMAGING TECHNIQUES INCLUDING PATIENT CARE	4	0	0	4	4	40	60	100
6	Core Course	RIT323	NEWER MODALITIES IMAGING TECHNIQUES INCLUDING PATIENT CARE LAB	0	0	4	2	4	30	20	50
7	Core Course	RIT304	QUALITY CONTROL IN RADIOLOGY AND RADIATION SAFETY	4	0	0	4	4	40	60	100
Total				16	0	12	22	28	250	300	550

Bachelor of Science In Medical Radiology & Imaging Technology Semester IV (Second year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT401	CROSS SECTIONAL ANATOMY AND PHYSIOLOGY	4	0	0	4	4	40	60	100
2	Core Course	RIT421	CROSS SECTIONAL ANATOMY AND PHYSIOLOGY LABORATORY	0	0	4	2	4	30	20	50
3	Core Course	RIT402	PHYSICS OF ADVANCED IMAGING TECHNOLOGY	3	0	0	3	3	40	60	100

4	Core Course	RIT422	PHYSICS OF ADVANCED IMAGING TECHNOLOGY LABORATORY	0	0	2	1	2	30	20	50
5	Core Course	RIT403	RADIOGRAPHIC TECHNIQUES OF ADVANCED IMAGING TECHNOLOGY	4	0	0	4	4	40	60	100
6	Core Course	RIT423	RADIOGRAPHIC TECHNIQUES OF ADVANCED IMAGING	0	0	4	2	4	30	20	50
7	Core Course	RIT404	REGULATORY REQUIREMENTS IN DIAGNOSTIC RADIOLOGY & IMAGING, ACT AND RULES, REGULATIONS FOR JCI, NABH, NABHR	4	0	0	4	4	40	60	100
8	Core Course	RIT424	REGULATORY REQUIREMENTS IN DIAGNOSTIC RADIOLOGY & IMAGING, ACT AND RULES, REGULATIONS FOR JCI, NABH, NABHR LABORATORY	0	0	4	2	4	30	20	50
TOTAL				15	0	14	22	29	280	320	600

Bachelor of Science In Medical Radiology & Imaging Technology Semester V (Third year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT501	QUALITY ASSURANCE & RADIATION SAFETY (AERB GUIDELINES) IN DIAGNOSTIC RADIOLOGY	4	0	0	4	4	40	60	100
2	Core Course	RIT521	QUALITY ASSURANCE & RADIATION SAFETY (AERB GUIDELINES) IN DIAGNOSTIC RADIOLOGY LABORATORY	0	0	4	2	4	30	20	50
3	Core Course	RIT502	HOSPITAL PRACTICE & CARE OF PATIENTS	4	0	0	4	4	40	60	100
4	Core Course	RIT522	HOSPITAL PRACTICE & CARE OF PATIENTS LABORATORY	0	0	4	2	4	30	20	100
5	Core Course	RIT503	NUCLEAR MEDICINE	4	0	0	4	4	40	60	100
6	Skill Enhanced Course	BCA101	COMPUTER FUNDAMENTALS & IT	3	0	0	3	3	40	60	100
7	Core Course	RIT504	RESEARCH METHODOLOGY AND BIOSTATISTICS	4	0	0	4	4	40	60	100
TOTAL				19	0	8	23	27	220	280	500

Bachelor of Science In Medical Radiology & Imaging Technology Semester VI (Third year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT001	INTERNSHIP AND PROJECT REPORT	0	0	600	25	600	120	180	300
TOTAL				0	0	600	25	600	120	180	300

Bachelor of Science In Medical Radiology & Imaging Technology Semester VII (Fourth year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT701	INTERVENTION RADIOLOGICAL TECHNIQUES AND CARE OF PATIENT	4	0	0	4	4	40	60	100
2	Core Course	RIT721	INTERVENTION RADIOLOGICAL TECHNIQUES AND CARE OF PATIENT LABORATORY	4	0	0	4	4	40	60	100
3	Core Course	RIT702	CT PROCEDURES	4	0	0	4	4	40	60	100
4	Core Course	RIT703	NUCLEAR MEDICINE PHYSICS	4	0	0	4	4	40	60	100
6	Core Course	RIT704	MRI PROCEDURES	4	0	0	4	4	40	60	100
7	Skilled Course	RIT705	FIRST AID	3	0	0	3	3	40	60	100
TOTAL				19	0	4	21	23	230	300	700

Bachelor of Science In Medical Radiology & Imaging Technology Semester VIII (Fourth year)

Sr. No	Category	Course Code	Course Title	Teaching Scheme			credits	Hours	Examination Scheme		Total
				L	T	P			Internal	External	
1	Core Course	RIT002	INTERNSHIP	0	0	600	26	600	100	100	200
2	Core Course	RIT003	PROJECT REPORT	0	0	8	4	8	20	80	100
TOTAL				0	0	608	30	608	120	180	300

A) Ability Enhanced Compulsory Courses (AECC)

Sr. No.	Category	Code	Subject	L	T	P	Credits
1.	AECC – 1	COM101	English Communication Theory/ Practical	2	0	2	2
2.	AECC – 2	ENS001	Environmental studies	2	0	2	2

B) Skill Enhanced Course (SEC).

Sr. No.	Category	Code	Subject	L	T	P	Credits
1.	SEC – I	BCA101	COMPUTER FUNDAMENTALS & IT	03	0	0	03
2.	SEC – II	RIT705	FIRST AID	03	0	0	03

C) Deficiency Course (DC)

Sr. No.	Category	Code	Subject
1.	DC	BIO000	Basic Biology

14. Projects:

Project is a core course, to be done typically after VII semesters for Honors Degree.

15. Major Internship:

a) Major Internship is a compulsory course of 25 credits, to be done typically in VI semester for degree Course and to be done in both VI & VIII in case of Honors degree. A student should undergo training for six months in VI semester for degree Course and in case of honors degree student should undergo training for six months in both VI and VIII Semester and will submit internship completion certificate from the concerned hospitals.

b) It is the responsibility of the Corporate Relations Department (CRD) to arrange for training for all the students. In the beginning of each academic session, Corporate Relations Department will prepare list of all potential Radiological Laboratories and Hospitals for training. These training organizations will be approached by the Corporate Relations Department with a request to provide training seats.

Consolidated lists of training offers will be made available to all the students in the beginning of semesters of the session. If a student is interested in making his/her own arrangement for the training seat, he/she will need to have the training organization approved by routing the application to the Dean of Faculty of Allied & Healthcare Sciences for approval.

c) The students will be required to get their training activity and results reviewed by organization in which they have attended the training. Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and the certificate issued by the corporate and will award a marks grade, which must be sent to the controller of examination. The clinics and Hospitals training, submission of project report and obtaining pass grade is mandatory requirement for award of Bachelor of Medical Radiology & Imaging Technology.

16. Grading System: University follows eight letter grading system (A+, A, B+, B, C+, C, D, and F) that have grade points with values distributed on a 10-point scale for evaluating the

performance of student. The letter grades and the corresponding grade points on the 10-point scale are as given in the table below.

Academic Performance	Range of marks	Grades	Grade Points
Outstanding	≥90	A+	10
Excellent	≥80 & < 90	A	9
Very Good	≥70 & < 80	B+	8
Good	≥60 & < 70	B	7
Fair	≥50 & < 60	C+	6
Average	>40 & < 50	C	5
Minimally Acceptable	40	D	4
Fail	< 40	F	0
Incomplete		I	–
Withdrawal		W	–
Grade Awaited		GA	–
S-Satisfactory, US- Unsatisfactory Minor Project		S/US	

a) Description of Grades:

D Grade: The D grades stands for marginal performance, i.e. it is the minimum passing grade in any course. D grade shall not be awarded below 30% marks, though each teacher may set higher marks for same

F Grade: The 'F' grade denotes a very poor performance, i.e. failing a course. A student has to repeat all courses in which she/he obtains 'F' grade, until a passing grade is obtained. In the case of 'F', no Grade points are awarded. However, the credits of such courses shall be used as denominator for calculation of GPA or CGPA.

W Grade: The 'W' grade is awarded to a student if he/she is allowed to withdraw for entire semester from the university on medical grounds for a period exceeding five weeks

I' Grade: The 'I' grade is awarded when the student is allowed additional opportunity like make up Examination etc. based on which the grade is to be decided along with other components of the evaluation during the semester 24 An incomplete grade of 'I' may be given when an unforeseen emergency prevents a student from completing the work in a course. The 'I' must be converted to a performance grade (A to F) within 90 days after the first day of classes in the subsequent regular semester.

X Grade: It is equivalent to Fail grade but awarded due to student falling below the laid down attendance requirement. Students having X grade shall be required to re-register for the course, when offered next.

b). Cumulative Grade Point Average (CGPA), it is a measure of overall cumulative performance of a student over all semesters.

The CGPA is the ratio of total credit points secured by a student in various courses in all Semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

NB: The CGPA can be converted to percentage by using the given formula: $CGPA \times 10 = \%$

e.g. $7.8 \times 10 = 78\%$

Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (Course title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

16.1 Acceptance of MOOC courses

Faculty of Allied & Healthcare Sciences (Medical Radiology & Imaging Technology) accepts the MOOC course available on SWAYAM platform for credit transfer.

40% of the courses can be taken from the available list of MOOCs on SWAYAM.

Instructions for MOOC courses

I. MOOC courses taken for credit transfer must be approved and recommended by Dean Academics and Dean of the Faculty before the start of the semester.

II. The copy of the list of courses taken by the students for any course has to be submitted to the Controller of the Examination.

III. MOOC course should be done from SWAYAM platform as per the guidelines of UGC.

IV. To obtain the credit the student needs to complete the assessment of the course and

provide the certificate of the course issued by the SWAYAM/NPTEL. After completing the certificate, the student must submit the certificate within a week to the department.

v. The fees (if any) for the registration and / or assessment of the MOOC course must be borne by the student only.

vi. The student can opt for a particular online MOOC course if and only if the credit of that course is equivalently mapped with the program structure.

vii. If the student obtains the same course credit which mapped with the course, then credit shall be considered for this course and the grade/marks provided by the accessing authority shall be transfer to the student. The result of the MOOC shall be take non record by the university examination cell and a result declared for these papers.

viii. For any particular semester, all results for the MOOC course must be submitted along with the marks of other papers of the same semester by the course coordinator.

ix. MOOC course coordinators shall be appointed for each of the course taken by the student.

17. General Rules: Examinations:

a) Showing the Answer Scripts: The answer scripts of all written Examinations i.e. Mid Term or end semester examination or any other written work conducted by a teacher shall be shown to the students.

b) Students desirous of seeing the marked answer scripts of end Semester Examination, has to ensure their presence before results are declared, as per dates notified by the Controller of Examination.

c) Marks/Answer Sheets of all other tests shall also be shared with the students and thus, there shall be no scrutiny of grades. However, before the grades are forwarded to Registrar/Controller of Examination, they should be displayed on GU-MS and time given to students, to discuss the same with respective faculty.

d) No appeal shall be accepted for scrutiny of grades.

e) Examination Fee for Supplementary. A fee of Rs.1000/- per course or as decided by the Management from time to time will be charged from the students.

18. Improvement of overall Score: A candidate having CGPA < 5.5 and wishes to improve his/her overall score may do so within two academic years immediately after passing the degree program by reappearing into maximum four course(s)/subject(s). The improvement would be considered if and only if the CGPA becomes > 5.5.

19. Program qualifying criteria: For qualifying the Program every student is required to earn prescribed credits (i.e. for a certificate course required credits are 45, for diploma course required credits are 89, for a degree course required credits are 137, for honors degree, required credits are 188. If any student fails to earn prescribed credits for the program, then he/she will get a chance to complete his/her Program in two more years than the actual duration of degree.

20. Revision of Regulations, Curriculum and Syllabi: The University may revise, amend, change or update the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies and the Academic Council as and when required.

21. Conditions for Award of a Degree:

a) Should complete the requirements of the Degree in maximum duration specified for the program. Semester withdrawals due to medical reasons are not counted in six years. However, forced withdrawal of students e.g. rustication or expulsion or nonattendance by student due to any other reasons, shall count in the maximum period of six years and minimum period of four years.

b) Successfully completing the Internship studies.

c) Should have cleared all the foundational and core courses of the programs. In case of lateral entry students (direct entry into second year) the student should have completed the foundational/core courses/equivalent courses, as approved at the time of admission in the programs.



**BACHELOR OF SCIENCE IN MEDICAL RADIOLOGY &
AND IMAGING TECHNOLOGY**

FACULTY OF ALLIED & HEALTH CARE SCIENCES

SEMESTER I

Core Course RIT101: HUMAN ANATOMY AND PHYSIOLOGY-I

Credits: 03

LTP 300 THEORY

Course Description: The course aims study of human anatomy which develops a basic understanding of the structure and function of body organs and systems and their interactions. The course includes nutrition, metabolism, and growth and development.

Course Outcomes (CO):

CO1: Know about different anatomical structures of Human Body **CO2:** Knowledge about Cellular & Tissue level of organization.

CO3: Understanding about Skeletal system & Bones.

CO4: Knowledge about Neurons & Nervous System.

CO5: To study about Endocrine System & Hormones.

Course Content

Unit I

Introduction to human body: Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

Cellular level of organization: Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

Unit II

Tissue level of organization: Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit III

Skeletal system: Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system. Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction.

Joints: Structural and functional classification, types of joints movements and its articulation.

Unit IV

Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid, structure and functions of brain (cerebrum, brain stem and cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

Unit V

Special senses: Structure and functions of eye, ear, nose and tongue and their disorders.

Endocrine system : Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Text-Books

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson.
2. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam.
3. Principles of Anatomy and Physiology by Tortora Grabowski

Core Course RIT121: HUMAN ANATOMY AND PHYSIOLOGY-I LABORATORY

Credits : 01

LTP 002

Course Description: The course aims study of human anatomy which develops a basic understanding of the structure and function of body organs and systems and their interactions. The course includes nutrition, metabolism, and growth and development

Course Outcomes (CLO):

CO1: Know about different anatomical structures of Human Body

CO2: Knowledge about Blood, CPR, Pulmonary Function Test and other associated processes.

CO3: Examine about the Location of various organs of our body and their associated structures

CO4: Understanding the different functions that are going in a human body and all physiological actions.

CO5: Identification of various Organs of body & Their location.

LIST OF PRACTICALS

Identification of Various Organs in the human Body:

- a) Liver
 - b) Heart
 - c) Kidney
 - d) Nephron
 - e) Lungs
 - f) Neuron
 - g) Ovary
- II. Demonstration of various parts of body
 - III. Estimation of blood pressure, cardiac cycle and respiration.
 - IV. Identification of blood cells and different counts.
 - V. The compound Microscope
 - VI. Hemoglobin percentage and colour index.
 - VII. Blood groups
 - VIII. Artificial respiration and C.P.R.
 - IX. Pulse rate, Heart rate and measurement of Blood Pressure.

Core Course RIT102: BASIC PHYSICS INCLUDING RADIOLOGICAL PHYSICS

Credits : 04

LTP 004

Text- Books :

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan.

THEORY

Course Description: The purpose of this course is to enable understanding of radiological Physics. The course includes Transformer, Generator & units of radiation.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Know about measurement & units .

CO2: Study about transformers, basic principles of transformer, along with its uses.

CO3: To study about generators & various types of generators

CO4: To study about various rectifiers, p-type and n-type semiconductors.

CO5: Overall Knowledge of units of radiation.

Course Content

Unit- I

Basic idea on measurement & units, force, work, heat and energy

Electrostatics - Electric charge and its units, capacitor, its principle, Energy stored in Capacitor, electric current, magnetic effects of current, solenoids, ohm's law and resistance.

Unit II

Transformers: Principles of transformer, Electromagnetic induction, transformer design, efficiency of transformer, Various types of transformers and working of step - down and step up along with its uses.

Unit III

Generators: Types of generators, 3 phase, 6 and 12 pulse circuits, falling load generators, Advantages of the 3-phase over single phase, Radiographic advantages of 3 phase X-Ray generators over single phase, 12 pulse circuit.

Unit IV

Rectifiers: Introduction, principle of rectification, half wave and full wave rectification, energy bands in solids, the semiconductor, p-type and n-type semiconductors, density of charge carriers and conductivity, p-n junction, p-n junction diode, p-n junction diode as rectifier (half-wave and full-wave rectifier),

Core Course

RIT122: BASIC PHYSICS INCLUDING RADIOLOGICAL PHYSICS LABORATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of radiological Physics. The course includes Transformer, Generator & units of radiation.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Know About A.C. and D.C. power supply.

CO2: Understanding the heating effect of current, Ammeter, voltmeter, Galvanometer.

CO3: To study about TLD badges and their uses and relative merits

CO4: Know about various energy bands in solids, the semiconductor

CO5: Understand the working of p-n junction diode as rectifier (half-wave and full-wave rectifier).

LIST OF PRACTICALS

I- A.C. and D.C. power supply with examples, single phase and poly phase power supply, switches, fuses

II- Heating effect of current, Ammeter, voltmeter, Galvanometer.

III-TLD badges and their uses and relative merits.

IV-Rectifiers: Introduction, energy bands in solids, the semiconductor, p-type and n-type semiconductors, density of charge carriers and conductivity, p-n junction, p-n junction diode,

V-p-n junction diode as rectifier (half-wave and full-wave rectifier)

Core Course

RIT103: CONVENTIONAL RADIOGRAPHY AND EQUIPMENT

Credits : 04

LTP 004

THEORY

Course Description: The purpose of this course is to enable understanding of Various Radiography Equipments.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Knowledge about x-ray tube, construction working and limitations, stationary anode x-ray.

CO2: Study about cassettes, Structure and function, Types, Design features.

CO3: Know about intensifying Screen & Filters :Structure and functions.

CO4: Know about how to control of scattered radiation beam limiting devices, cones, diaphragms.

CO5: Understanding about various fluorescence and phosphorescence

Course Content

Unit I

X-ray tubes: x-ray tube, construction working and limitations, stationary anode x-ray tube; construction, working, methods of cooling the anode, rotating anode x-ray tube: construction, working rating chart, speed of anode rotation, angle of anode inclination, dual focus and practical consideration in choice of focus, anode heel effect.

Unit II

Cassettes: Structure and function, Types, Design features and consideration with loading/unloading, Care and maintenance (cleaning)

Unit III

Intensifying Screen & Filters :Structure and functions, common phosphors used for determination of relative speeds, types, screen mounting, care and maintenance of film screen contact.

Unit IV

Control of scattered radiation: Beam limiting devices: cones, diaphragms, light beam collimator, beam centering device, methods to verify beam centering and field alignment,

Grid: Purpose and function, grid ratio, grid cut-off effect on radiation exposure, use of grid, structure and materials. Types: stationary, parallel, focused, cross-hatch Moving grids. Purpose/advantages/disadvantages.

Unit V

Fluoroscopy: Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table.

Text- Books :

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan.

Core Course

RIT123: CONVENTIONAL RADIOGRAPHY AND EQUIPMENT LABORATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of Various Radiography Equipments.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Knowledge about x-ray tube, construction working and limitations, stationary anode x-ray.

CO2: Study about cassettes, Structure and function, Types, Design features.

CO3: Know about intensifying Screen & Filters : Structure and functions.

CO4: Know about how to control of scattered radiation beam limiting devices, cones, diaphragms.

CO5: Understanding about various fluorescence and phosphorescence

LIST OF PRACTICALS

- X-ray tube, its features & Parts
- Image intensifier, its features, spot film.
- Grids, its features & types Effects of kV and mAs.

Core Course

RIT104: RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES

Credits : 04

LTP 004

Text- Books :

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan.

THEORY

Course Description: The purpose of this course is to enable understanding of Imaging Processing Techniques .

Course Outcomes (CLO): Through this course student should be able to:

CO1: Introduction to X-Rays, Properties of X- Rays, X-Ray production .

CO2: Study about film, types, composition of single and double coated radiographic films.

CO3: Study about purpose and location of dark room.

CO4: Study about Image formation.

CO5: Knowledge about automatic processing.

Course Content

Unit I

Introduction to X-Rays, Properties of X- Rays, X-Ray production ,Bremstrahlung phenomenon, factors affecting X-Ray emission spectra, X-Ray quality and quantity.

Unit II

Film: Types, composition of single and double coated radiographic films, Screen & Non Screen films, structure of film, characteristic curve. characteristics (speed, base + fog, gamma, latitude), Film storage rules and guidelines, film handling and care (size, construction and function), film contrast.

Unit III

Introduction, purpose and location of dark room, layout of dark room, entrance, pass box, hatch, hangers, safe light, criteria of safe light, safe light test.

Unit IV

Image formation, latent image, processing: manual processing, . Developer, fixer, rinser components, replenisher. Manual technique of developing film.

Unit V

Automatic processing: Automatic film processor, common errors in processing.

Core Course

RIT124: RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES LABORATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of Imaging Processing Techniques .

Course Outcomes (CLO): Through this course student should be able to:

CO1: Introduction to Loading and unloading of films

CO2: Study about film,types,composition of single and double coated radiographic films.

CO3: Study about Preparation of fixer.

CO4: Study about Maintenance of processing tank.

CO5: Knowledge about Safe light test.

LIST OF PRACTICALS In

Dark Room

1. Loading and unloading of films
2. Cassette handling
3. Preparation of developer
4. Preparation of fixer
5. Developing methods
6. Safe light test.

ELECTIVE COURSE 1

COM101: ENGLISH COMMUNICATIONS

Credits : 02

LTP 200

Course Description: To make students capable of using English language in context. To enhance effective reading and writing skills.

Course Outcomes (CLO): The students will develop a minute practical knowledge about English grammar and its usage

CO1: Knowledge about x-ray tube, construction working and limitations, stationary anode x-ray.

CO2: The students will develop an understanding of the importance of free expression

Course Content:

Unit I

Reading Skills: Comprehension of Unseen Passage Reading articles] (Intermediate) Summary Paraphrasing, Translation and Precis Writing

Unit II

English Grammar and Usage: Parts of speech, common errors in writing (based on Parts of Speech) Tenses, Change of Voice, and Transformation of Sentences.

Unit III

Basic Writing Skills and Writing Practices: Paragraph/essay writing, short life story writing, Notice (General like trip, change of name, function) making notes and Letter writing

Unit IV

Vocabulary Enhancement: Synonym, Antonym, Idioms and Phrasal verbs

Recommended Books / Suggested Readings:

1. Practical English Usage by Michael Swan OUP.
2. Communication Skills by Sanjay Kumar and PushpLata.

COM121: ENGLISH COMMUNICATION LAB

Credits : 01

LTP 002

Course Description: The course aims to equip the students with focus on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

The course includes description of sights seen in everyday life, pronunciation of different words and its correct usage.

Course Outcomes (CLO): The students will develop a minute practical knowledge about English grammar and its usage

CO1: Better understanding of nuances of English language through audio- visual experience and group activities

CO2: Speaking skills with clarity and confidence enhancing their employability skills

CO3: Better comprehension of speech of people of different backgrounds and regions.

CO4: Ability to use English grammar accurately.

Course Content:

Unit I

Daily Discourse: Common Everyday Situations: Conversations and Dialogues, Monologue, and Communication at workplace.

Unit II

Listening Skills: Listening skills on Social Interactions.

Unit III

Phonetic Skills: Pronunciation, Intonation, Stress and Rhythm

Unit IV

Speaking Skills: Group Discussion / Debate, Role Plays

Recommended Books / Suggested Readings:

1. Cambridge English Empower Elementary Student's Book by Cambridge University Press
2. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
3. Study Writing. Liz Hamp-Lyons and Ben Heasley, Cambridge University Press.2006.
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Practical English Usage. Michael Swan. OUP. 1995.

SEMESTER II

Core Course

RIT201: HUMAN ANATOMY AND PHYSIOLOGY II

Credits : 03

LTP 300

THEORY

Course Description: The course aims study of human anatomy which develops a basic understanding of the structure and function of body organs and systems and their interactions. The course includes nutrition, metabolism, and growth and development.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Know about different anatomical structures of Human Body.

CO2: Study about Digestive system & various organs involved in it.

CO3: Knowledge about Urinary System & functioning of Kidney.

CO4: Study about Circulatory & Respiratory system & also about reproductive & Lymphatic system.

CO5: Know about various body fluids & physiological functions associated

Course Content

Unit I

Alimentary system: mechanism and physiology of digestion and absorption structure & function (Mouth, Tongue, Teeth, Oesophagus, Pharynx, Stomach, Intestine, Rectum, Anus; Digestive glands; physiology of digestion of carbohydrates, lipids& proteins, structure and function of liver.

Urinary system: Main parts, Structure & function of kidney, structure of nephron, physiology of excretion & urine formation, urine, additional excretory organs.

Unit II

Circulatory system: Composition and functions of blood, anatomy and physiology of Heart, circulation of blood, cardiac cycle and conducting system of Heart, the blood pressure, arteries and veins

Respiratory system-Organs of respiration and their histology, Respiration (definition and mechanism), Gas exchange in the lungs, Regulation of respiration, Basal metabolic rate.

Unit III

Reproductive system- Male and female reproductive system, Histology of gonads, the ovarian cycle and ovulation, Fertilization, spermatogenesis.

Unit IV

Lymphatic system- Introduction, Structure and function, Lymph nodes, Spleen, Thymus gland, Tonsils

Unit V

Body fluids and their significance: Important terms, types of body fluid, total body water, avenues by which water leaves and enters body, general principles for fluid balance, cardinal principle, how body fluids maintain Homeostasis, Electrolytes & ions Function of electrolytes, how electrolyte imbalance leads to fluid imbalance

Recommended Books / Suggested Readings:

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson.
2. Text book of Medical Physiology by Arthur C. Guyton and John E.
3. Principles of Anatomy and Physiology by Tortora Grabowski.

Core Course

RIT221: HUMAN ANATOMY AND PHYSIOLOGY LABORATORY II

Credits: 1

LTP 002

Course Description: The course aims study of human anatomy which develops a basic understanding of the structure and function of body organs and systems and their interactions. The course includes nutrition, metabolism, and growth and development.

Course Outcomes (CLO):

- CO1:** Know about muscular and nervous tissue
- CO2:** Identification of axial bones.
- CO3:** Identification of appendicular bones.
- CO4:** Understanding the difference between bleeding and Clotting Time.
- CO5:** Identification of Various parts of Reproductive System.

LIST OF PRACTICAL

1. Microscopic study of muscular and nervous tissue
2. Identification of axial bones
3. Identification of appendicular bones
4. Introduction to hemocytometry.
5. Determination of bleeding time
6. Determination of clotting time
7. Study of Male and Female Reproductive

CORE COURSE

RIT202: CLINICAL RADIOGRAPHY POSITIONING PART I

Credits : 01

LTP 002

THEORY

Course Description: The purpose of this course is to enable understanding of Body positioning required during x-ray.

Course Outcomes (CLO): The students will develop a minute practical knowledge about English grammar and its usage

CO1: Knowledge about upper limb–x-ray positioning.

CO2: Study about lower limb–x-ray positioning.

CO3: Understanding about various vertebral column -curves, postures, atlanto-occipital region, cervical spine - cervico thoracic spine, thoracic spine, lumbar spine sacrum, coccyx

CO4: Know about bones of thorax.

CO5: Study about soft tissue radiography.

Course Content:

Unit I

Upper limb–x-ray positioning of Fingers individuals and as a whole hands, carpal tunnel, wrists, forearm, humerus, shoulder joint, clavicle. basic views.

Unit II

Lower limb –x-ray positioning of toes, foot, calcaneus, ankle joint, leg, knee joint, patella femur, x-ray positioning of Hip and pelvis Chest including thoracic cage and sternum.

Unit III

Vertebral column -curves, postures, atlanto-occipital region, cervical spine -cervico thoracic spine, thoracic spine, lumbar spine sacrum, coccyx

Unit IV

Bones of thorax–Sternum anatomy sternum projections, Ribs projections ribs anatomy

Fractures of upper limb, lower limb, vertebral column and ribs

Recommended Books / Suggested Readings:

1. Radiography positioning by Clark.
2. Radiology of positioning for technician by O p Sharma.

Core Course

RIT222: CLINICAL RADIOGRAPHY POSITIONING PART I LABORATORY

Credits: 2

LTP 004

Course Description: The purpose of this course is to enable understanding of Body positioning required during x-ray.

Course Outcomes (CLO):

CO1: Know About Upper limb radiography

CO2: Understanding the Lower limb radiography

CO3: Knowledge about Spinal radiography

CO4: Know about various soft tissue larynx, Larynx, pharynx

LIST OF PRACTICAL

Performed Regional radiography-

o Upper limb radiography

o Lower limb radiography

o Spinal radiography

o Soft tissue larynx, Larynx, pharynx, nasopharynx.

Core Course

RIT203: MODERN RADIOLOGICAL & IMAGING EQUIPMENT INCLUDING PHYSICS

Credits: 4

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of various modern radiological equipments.

Course Outcomes (CLO):

CO1: Study about Mammography.

CO2: Knowledge about Special equipment, Portable and mobile x-ray.

CO3: Study About CT - Basic physics.

CO4: Study about Computed radiography & Digital Radiography.

CO5: Study about Equipment for Dental Radiography

Course Content

Unit I

Mammography, History of mammography, Mammographic equipment, Mammographic radiation dose and exposure. Dedicated mammographic unit and its special features, Types of mammograph Routine Mammographic Positioning & Views with additional views and technical considerations.

Unit II

Special equipment: Portable and mobile x-ray units, Generator, x-ray tubes; Accessories; Resolution, Advantages & Disadvantages of Portable and mobile x-ray unit.

Unit III

CT - Basic physics—Tomography principle, CT instrumentation, imaging system, computer system, image display, recording, storage and communication system.

Unit IV

Computed radiography: its principle, physics & equipment. Digital Radiography. Flat panel digital fluoroscopy and radiography system, Direct and indirect digital radiography and fluoroscopy systems. Digital radiography and Computed radiography its advantages, disadvantages and applications.

Unit V

Equipment for Dental Radiography: Intra oral radiography unit, the orthopantomograph unit (OPG)

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan.

Core Course

RIT223: MODERN RADIOLOGICAL & IMAGING EQUIPMENT INCLUDING PHYSICS

LABORATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of various modern radiological equipments.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Knowabout portable X-Ray Equipment.

CO2: Study about Mammography X-Ray tube

CO3: Study about Dental X-Ray unit.

CO4: Knowledge about Computed Tomography Parts.

LIST OF PRACTICALS

- Portable X-Ray Equipment.
- Mammography X-Ray tube
- Dental X-Ray unit.
- Computed Tomography Parts

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.

2.The physics of radiology and imaging by K thayalan.

www.wikipedia.co.in

www.radiopedia.co.in

Core Course

RIT204: CONTRAST AND SPECIAL RADIOGRAPHY PROCEDURES

Credits: 4

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of Special Radiography Procedures.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Study about special radiographic procedures.

CO2: Knowledge about Contrast Media and Patient Management Emergency Drugs in the Radiology Department .

CO3: Study About Fluoroscopy, general considerations.

CO4: Study about Biliary system Investigations.

CO5: Study about Urinary system Investigations

Course Content

Unit I

Special radiographic procedures Responsibility of Radiographer during Radiological Procedures. Preparation of Patient for Different Procedures.

Unit II

Contrast Media - Positive and Negative, Ionic & Non – Ionic Adverse Reactions To Contrast Media and Patient Management Emergency Drugs in the Radiology Department Emergency Equipment's In the Radiology Department, Aseptic technique Indications, contraindications, basic techniques and relationship to other techniques of the following special procedures .

Unit III

Gastrointestinal Tract: Fluoroscopy, general considerations, responsibility of radiographers, Barium swallow, pharynx and esophagus, Barium meal and follow through Hypotonic duodenography Small bowel enema Barium Enema routine projections for colon and rectum, colonic activators; double contrast studies; colostomy. Special techniques for specific disease to be examined Water soluble contrast media - eg. gastrograffin studies b. Salivary glands: Routine technique, procedure – sialography c.

Unit IV

Biliary system: Plain film radiography Intravenous cholangiography Percutaneous cholangiography. Endoscopic retrograde cholangio-pancreatography (ERCP) Operative cholangiography Post-Operative cholangiography (T - tube Cholangiography).

Unit V

Urinary system: Intravenous urography, Retrograde pyelography, Antegrade pyelography Cystography and micturating cystourethrography Urethrography (ascending), Renal puncture. Female reproductive system: Hysterosalpingography.

Respiratory system: Bronchography: Awareness. h. Sinusography: Routine technique and procedure.

Books Recommended-

1. Radiological procedures by Dr.bushan n lakhar.
2. A guide on special radiographic investigations & techniques by Dr.kushal gehiot.
3. Special investigations by Champman.

CORE COURSE

RIT224: CONTRAST AND SPECIAL RADIOGRAPHY PROCEDURES LABORATORY

Credits: 2

LTP 004

Course Description: The purpose of this course is to enable understanding of Special Radiography Procedures.

Course Outcomes (CLO):

CO1: Know about Radiography in various positions for all the special radiological procedures, using contrast media.

CO2: Identification of various films for all the special radiological procedures, using contrast media and related pathologies

LIST OF PRACTICALS

- Radiography in various positions for all the special radiological procedures, using contrast media
- Identification of various films for all the special radiological procedures, using contrast media and related pathologies

ABILITY ENHANCED COMPULSORY COURSE II

ENS001: ENVIRONMENTAL STUDIES

Credits : 02

LTP 200

Course Description: The course aims to equip the students with causes and consequences of different kinds of global environmental problems and develop the thinking about the remedial measures of these problems.

Course Outcomes (CLO): Through this course student should be able to:

CO1: To understand the multidisciplinary nature of environment and ecosystem

CO2: To provide an introduction to renewable and non-renewable resources of energy.

CO3: To become familiar with biodiversity and its conservation.

CO4: To analyze the various environmental practices, policies and pollutions.

Course Content

Unit 1: Introduction to environmental studies

- Multidisciplinary nature of environmental studies; components of environment –atmosphere, hydrosphere, lithosphere and biosphere.
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2: Ecosystems

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3: Natural Resources: Renewable and Non-renewable Resources

- Land Resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

- Heating of earth and circulation of air; air mass formation and precipitation.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4: Biodiversity and Conservation

- Levels of biological diversity :genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5: Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil, chemical and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).
- Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

Unit 7: Human Communities and the Environment

- Human population and growth: Impacts on environment, human health and welfare.
- Carbon foot-print.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquakes, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental

conservation.

- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8: Field work

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Suggested Readings:

1. Silent Spring by Carson.
2. Global Ethics and Environment by Gleeson, B.

Course code: BIO000

Course name: Basic Biology

Credits:3

LTP 300

THEORY

Course Description: Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, and various organ systems to understand basic biology. This subject will develop basic understanding of biology.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:

CO1: Different branches of biology, scientific methods, scope and structure/function of different tissues.

CO2: Cells-its structure and functions of different organelles.

CO3: Different molecules of cells, cell cycle, DNA and RNA role in protein synthesis.

CO4: Different organ system and body fluids and their significance.

Course Content

Unit I

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in medical streams. Structure and function of tissues - epithelial, connective, muscular and nervous.

Unit II

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self-contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of prokaryotic and eukaryotic, cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis); cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes.

Unit III

Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, nucleotides, nucleic acids (DNA and RNA), Cell division: Binary

fission, Cell cycle: Mitosis, Meiosis, Continuity of life - heredity, variation; Mendel's laws of inheritance, chromosomal basis of inheritance; other patterns of inheritance- incomplete dominance, multiple allelism, quantitative inheritance. Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination; DNA as a genetic material-its structure and replication; structure of RNA and its role in protein synthesis.

Unit IV

Organ systems: Various parts of Respiratory system, Cardiovascular system, Lymphatic system, Digestive system, Excretory system and their functions. Body fluids and their significance: Important terms, types of body fluid, total body water, avenues by which water leaves and enters body, general principles for fluid balance, how body fluids maintain Homeostasis, Electrolytes & ions Function of electrolytes.

Recommended Books:

1. A text book of biology by Pradeep's publications.
2. A text book of biology by Trueman.
3. NCERT 12th Biology book.
4. Fried, G.H. & Hademenos, G.J. (2002). Schaum's Biology. Tata McGraw Hill Publications, New Delhi.

THIRD SEMESTER

RIT301: PHYSICS OF NEWER IMAGING MODALITIES

Credits: 04

LTP 400 (THEORY)

Course Description: The purpose of this course is to enable understanding of Physics of Newer Imaging Modalities.

Course Outcomes (CLO):

CO1: Study about Basic principle of CT scan.

CO2: Study about Scanning principle, Image acquisition, Image reconstruction, Image manipulation, Image display and documentation

CO3: Knowledge about CT Artifacts- Classification, Types, Causes.

CO4: Knowledge about CT scan studies acquisition/ protocols /techniques.

CO5: Study & Knowledge about Patient preparation, Imaging techniques and protocols for- CT Angio, Brain, C.T Enteroclysis/ CT IVP/ dual phase CT, CT Guided FNAC / biopsy

Unit I

Basic principle of CT scan, history of CT Scan, EMI, advantages and disadvantages, Equipment description, CT image quality, CT image display Advanced Computed Tomography Helical CT scan: Slip ring technology.

Unit II

Scanning principle, Image acquisition, Image reconstruction, Image manipulation, Image display and documentation, Scanning parameters, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR.

Unit III

CT Artifacts- Classification, Types, Causes, , Diagnostic aspects of CT and post Processing Techniques HRCT.

Unit IV

CT scan studies acquisition/ protocols /techniques: CT of head and neck – thorax – abdomen – pelvis – musculo skeletal system – spine – PNS. 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.

Unit V

CT procedures: patient preparation, Imaging techniques and protocols for- CT Angio mainly Brain, C.T Enteroclysis/ CT IVP/ dual phase CT, CT Guided FNAC/ biopsy.

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan.

CT made Easy www.wikipedia.co.in www.radiopedia.co.in

CORE COURSE

RIT321: PHYSICS OF NEWER IMAGING MODALITIES LABORATORY

Credits: 02

LTP 400

Course Description: The purpose of this course is to enable understanding of Physics of Newer Imaging Modalities.

Course Outcomes (CLO):

CO1: Know About the Physics, scanning principle and image formation in CT .

CO2: Identification of different parts of CT scanner

CO3: Study about Applications of various procedures in well-equipped Hospitals and Diagnostic Centers

CO4: To Understand Various quality control of CT

LIST OF PRACTICALS:

- Physics, scanning principle and image formation in CT
- Identification of different parts of CT scanner
- Applications of various procedures in well-equipped Hospitals and Diagnostic Centers
- Quality control of CT .

Core Course

RIT302: CLINICAL RADIOGRAPHY POSITIONING PART II

Credits : 04

LTP 400 THEORY

Course Description: The purpose of this course is to enable understanding of Various body positions required for X-ray.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Knowabout Radiography technique comprising of the complete. Radiography of Skull and Radiography of cranial bones.

CO2: Understand Various Dental Radiography.

CO3: Study about Various views of abdomen radiography.

CO4: To Understand High KV techniques principle and its applications.

CO5: Know about various Macro radiography.

Course Content

Unit I

Radiography technique comprising of the complete. Radiography of Skull and Radiography of cranial bones; including special techniques for Sella turcica, orbits, optic foramina, superior orbital fissure and inferior orbital fissure etc. Facial bones; Paranasal sinuses, Temporal bone and Mastoids.

Unit II

Dental Radiography: Radiography of teeth-intra oral, extra oral and occlusal view.

Unit III

Abdomen: Preparation of patient. General abdominal radiography and positioning for fluid and air levels. Plain film examination. Radiography of female abdomen to look for pregnancy. Radiography in case of acute abdomen.

Unit IV

High KV techniques principle and its applications. Soft tissue Radiography. Localization of foreign bodies. Various techniques Ward /mobile radiography - electrical supply, radiation protection, equipment and instructions to be followed for portable/ward radiography.

Unit V

Macro radiography: Principle, advantage, technique and applications. Stereography - Procedure - presentation, for viewing, stereoscopes, stereometry.

Books Recommended-

1. Radiography positioning by Clark.
2. Radiology of positioning for technician by O p Sharma.

CORE COURSE

RIT322: CLINICAL RADIOGRAPHY POSITIONING PART II LABORATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of Various body positions required for X-ray.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Study about all views and techniques Abdomen: Gastro-intestinal tract ,urinary tract.

CO2: Knowledge about Skeletal Survey. LIST OF PRACTICALS

All views and techniques:

- Abdomen.
- Gastro-intestinal tract.
- urinary tract
- Skeletal Survey.

Core Course

RIT303: NEWER MODALITIES IMAGING TECHNIQUES INCLUDING PATIENT CARE

Credits : 4

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of Techniques Required for newer imaging Modalities.it will also include the modes and methods for care of patients

Course Outcomes (CLO):

CO1: Knowledge about basic angiography and DSA.

CO2: Understand the diagnostic procedure angiography, angioplasty, biliary examination, renal evaluation and drainage procedure.

CO3: Understand the diagnostic procedure Angiography: a. Carotid Angiography (4 Vessel angiography) b. Thoracic and Arch Aortography c. Selective studies: Renal, SMA, Coeliac axis d. Vertebral angiography e. Femoral arteriography f. Angiocardiology.

CO4: Understanding about diagnostic procedure Venography: a. Peripheral venography b. Cerebral venography c. Inferior and superior venocavography d. Relevant visceral phlebography.

CO5: StudyDiagnostic procedure Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, Electrophysiology.

Course Content

Unit I

Interventional Radiography: Basic angiography and DSA: a. History , technique, patient care b. Percutaneous catheterisation, catheterization sites, Asepsis c. Guidewire, catheters, pressure injectors, accessories d. Use of digital subtraction- single plane and bi-plane.

Unit II

Diagnostic procedure angiography, angioplasty, biliary examination, renal evaluation and drainage procedure. Central Nervous System: a. Myelography b. Cerebral studies c. Ventriculography Arthrography

Unit III

Diagnostic procedure Angiography: a. Carotid Angiography (4 Vessel angiography) b. Thoracic and Arch Aortography c. Selective studies: Renal, SMA, Coeliac axis d. Vertebral angiography e. Femoral arteriography f. Angiocardiology.

Unit IV

Diagnostic procedure Venography: a. Peripheral venography b. Cerebral venography c. Inferior and superior venocavography d. Relevant visceral phlebography

Unit V

Diagnostic procedure Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, Electrophysiology.

Books Recommended-

1. Cardiac catheterization, angiography, and intervention by Mauro moscucci.

www.wikipedia.co.in

Core Course

RIT323: NEWER MODALITIES IMAGING TECHNIQUES INCLUDING PATIENT CARE

LABORATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of Techniques Required for newer imaging Modalities. It will also include the modes and methods for care of patients

Course Learning Outcomes (CLO): Through this course student should be able to

C01: Study About Medical records and documentation.

C02: Knowledge about Legal issues in radiology department, PNDT Act.

C03: Learn about Professional ethics and Code of conduct of radiographer.

C04: Study about Local anesthesia and general anesthesia .

C05: Knowledge about Facilities regarding general Anesthesia in the X-ray department

LIST OF PRACTICAL

- Medical records and documentation
- Legal issues in radiology department, PNDT Act
- Professional ethics and Code of conduct of radiographer
- Local anesthesia and general anesthesia
- Facilities regarding general Anesthesia in the X-ray department
- Management of adverse reactions to contrast media

Core Course

RIT304: QUALITY CONTROL IN RADIOLOGY AND RADIATION SAFETY

Credits : 04

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of Various effects of Ionizing Radiation.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Knowledge about the Radiation protection.

CO2: Understand various biological effects of Ionizing Radiatin

CO3: Know About Various dose fractionation.

CO4: Get Idea about the measuring systems – free air ionization chamber – thimble ion chamber – condenser chamber – Secondary standard dosimeters – film dosimeter – chemical dosimeter.

CO5: Know about various biological effects of non-ionizing radiation.

Course Content

Unit I

Radiation protection, Natural and background radiation (cosmic, terrestrial), Principles of radiation protection, Time - distance and shielding, shielding calculation and radiation survey, Personnel dosimeters (TLD and film batches), occupational exposure, radiation protection of self and patient, ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection, Revision of Somatic & Genetic Radiation effects, Units Detection & measurements Radiation protection Standards, radiation surveys & regulations. Patient Protection

Unit II

Biological effects of Ionizing Radiatin, Ionization, excitation and free radical formation, hydrolysis of water, Action of radiation on cell, DNA, RNA, chromosome, tissue and organ, cytoplasm, cellular membranes, effects of whole body and acute irradiation.

Unit III

Dose fractionation. Effects of ionizing radiation on each of major organ system including fetus

stochastic and non-stochastic effects. Mean and lethal dose, direct and indirect effects, multi target and multi hit theory, stochastic and deterministic effects-Acute exposure and chronic exposure-LD50 - factors affecting radio sensitivity.

Unit IV

Measuring systems – free air ionization chamber – thimble ion chamber – condenser chamber – Secondary standard dosimeters – film dosimeter – chemical dosimeter- Thermoluminescent Dosimeter. - Pocket dosimeter Radiation survey meter- wide range survey meter -zone monitor-contamination monitor their principle function and uses. Advantages & disadvantages of various detectors & its appropriateness of different detectors for different type of radiation measurement.

Unit V

Biological effects of non-ionizing radiation like ultrasound, lasers, IR, UV and magnetic fields.

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan.

SEMESTER IV

Core Course

RIT401: CROSS SECTIONAL ANATOMY AND PHYSIOLOGY

Credits : 04

LTP 400

THEORY

Course Description: The purpose of this course is to help the technologist in MRI and CT to identify the anatomy being imaged and to communicate effectively with the radiologist and physicians

Course Outcomes (CLO): Through this course student should be able to

CO1: Concept about Sectional Anatomy & Terminology.

CO2: Learn Anatomy of the upper thorax.

CO3: Learn CT/MRI Images of the Thorax - Normal and pathologic.

CO4: Study about Anatomy of the Pelvis- Bony structures and associated muscles.

CO5: Study about Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem& Arterial/venous systems.

Unit I

Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology.

Unit II

Anatomy of the upper thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels. Divisions of the mid-thorax, heart and great vessels- Lungs, heart and great vessels, Esophagus

Unit III

CT/MRI Images of the Thorax - Normal and pathologic. Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels CT/MR Images of Abdomen - Normal and pathologic

Unit IV

Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems. Reproductive Organs CT/MR Images of the Male/Female Pelvis- Normal and

pathologic. Neuro Anatomy- Scan planes.

Unit V

Brain-Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves Spine- Vertebra and disc, Spinal cord and meninges Neck- Arterial/venous systems, Muscles, Glands and pharynx.

Text Books:

1. Imaging atlas of human anatomy by Weir & Abraham's.
2. Textbook of anatomy & physiology by PR Ashalatha & G Deepa's.

Online references:

1. Coursera subscription for online anatomy topics.

Core Course

RIT421: CROSS SECTIONAL ANATOMY AND PHYSIOLOGY LABORATORY

Credits : 02

LTP 004

THEORY

Course Description: The purpose of this course is to help the technologist in MRI and CT to identify the anatomy being imaged and to communicate effectively with the radiologist and physicians

Course Outcomes (CLO): Through this course student should be able to

CO1: Identification and description of all anatomical structures

CO2: Demonstration of dissected parts.

CO3: Demonstration of skeleton-articulated and disarticulated.

CO4: Know about Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

LIST OF PRACTICALS

1-Identification and description of all anatomical structures.

2-Demonstration of dissected parts

3-Demonstration of skeleton-articulated and disarticulated.

4-Surface anatomy: Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

Core Course

RIT402: PHYSICS OF ADVANCED IMAGING TECHNOLOGY

Credits : 03

LTP 300

THEORY

Course Description: The purpose of this course is to enable understanding of Physics of Advanced Imaging Equipments.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Study about Introduction of MRI & Contrast agents used in MRI,.

CO2: Study about various MR Instrumentation & Types of magnets.

CO3: Knowledge about MR Angiography – TOF & PCA

CO4: Learn about Advanced technique & instrumentation of MRI.

CO5: Methods of MRI imaging.

Course Content

Unit I

History of MRI, Magnetism, Basic Principle, hardware, Types of Contrast agents used in MRI, Physical and physiological basis of magnetic relaxation, Image contrast and noise, Spin Echo, Inversion Recovery, Gradient Echo.

Unit II

MR Instrumentation: Types of magnets – RF transmitter – RF receiver – Gradient coils – shim coils – RF shielding – computers. d. Image formation: 2D Fourier transformation method – K-space representation – 3D Fourier imaging – MIP. e. MR contrast media –

Unit III

MR Angiography – TOF & PCA – MR Spectroscopy – functional MRI, 3D images- MRS blood flow imaging, diffusion/perfusion scans - strength and limitations of MRI

Unit IV

Advanced technique & instrumentation of MRI a. Basic Principles: Spin – precession – relaxation time – pulse cycle – T1 weighted image – T2 weighted image – proton density image. b. Pulse sequence: Spin echo pulse sequence – turbo spin echo pulse sequence - Gradient echo sequence – Turbo gradient echo pulse sequence - Inversion recovery sequence – STIR sequence – SPIR sequence – FLAIR sequence – Echo planar imaging –

Advanced pulse sequences.

Unit V

MRI Scanners: Methods of MRI imaging methods – Brain and Neck, Thorax, Abdomen, Knee, Spine - Clinical indications and contraindications, Protocols for various studies- slice section- patient preparation-positioning of the patient -patient care-calibration - paramagnetic agents and dose, additional techniques and recent advances in MRI - image acquisition-modification of procedures in an unconscious or un co-operative patient - plain studies- contrast studies -special procedures- reconstructions.

Books Recommended-

1. Mri made easy by Govind b chavhan.

Core Course

RIT422: PHYSICS OF ADVANCED IMAGING TECHNOLOGY LABORATORY

Credits: 2

LTP 004

Course Description: The purpose of this course is to enable understanding of Physics of Advanced Imaging Equipments.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Learn about Physics, scanning principle and image formation in USG, CT and MRI .

CO2: Study about Identification of different parts of MR scanner

CO3: Learn about various applications of various procedures in well-equipped Hospitals and Diagnostic Centers.

LIST OF PRACTICALS

- Physics, scanning principle and image formation in USG, CT and MRI
- Identification of different parts of MR scanner
- Applications of various procedures in well-equipped Hospitals and Diagnostic Centers.

Core Course

RIT403: RADIOGRAPHIC TECHNIQUES OF ADVANCED IMAGING TECHNOLOGY

Credits : 4

LTP : 400

THEORY

Course Description: The purpose of this course is to enable understanding of Radiographic Techniques of Advanced Imaging Technology.

Course Outcomes (CLO):

CO1: Study about Ultrasonography/ Doppler studies.

CO2: Understanding about Interaction of US with matter.

CO3: Study about Real-time ultrasound.

CO4: Knowledge about Techniques for imaging different anatomic areas, ultrasound artifacts, biological effects and safety.

CO5: Learn about Patient preparation for Doppler, Doppler artifacts & vascular sonography

Course Content

Unit I

Ultrasonography/ Doppler studies: Production of ultrasound: Piezoelectricity, Medical ultrasound transducer: Principle, construction and working, characteristics of US beam, Basic Acoustics, Ultrasound terminologies: acoustic pressure, power, intensity, impedance, speed, frequency, dB notation: relative acoustic pressure and relative acoustic intensity.

Unit II

Interaction of US with matter: reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients, US machine controls, US focusing, . Ultrasound display modes: A, B, M .

Unit III

Real-time ultrasound: Line density and frame rate, Real-time ultrasound transducers: mechanical and electronic arrays, ultrasound artifacts, ultrasound recording devices, and Distance, area & volume measurements.

Unit IV

Techniques for imaging different anatomic areas, ultrasound artifacts, biological effects and safety.

Unit V

Doppler Ultrasound- Patient preparation for Doppler, Doppler artifacts, vascular sonography

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.

2. The physics of radiology and imaging by K thayalan.

www.wikipedia.co.in // www.radiopedia.co.in

Core Course

RIT423: RADIOGRAPHIC TECHNIQUES OF ADVANCED IMAGING TECHNOLOGY

LABORATORY

Credits : 3

LTP : 004

Course Description: The purpose of this course is to enable understanding of Radiographic Techniques of Advanced Imaging Technology.

Course Outcomes (CLO):

CO1: Know About Physics, scanning principle and image formation in CT/MRI/USG

CO2: Identification of different parts of CT /MRI/USG scanner

CO3: Applications of various procedures in well-equipped Hospitals and Diagnostic Centers .

CO4: Quality control of CT /MRI.

LIST OF PRACTICALS

- Physics, scanning principle and image formation in CT/MRI/USG
- Identification of different parts of CT /MRI/USG scanner
- Applications of various procedures in well-equipped Hospitals and Diagnostic Centers

Quality control of CT /MRI

Core Course:

RIT404: REGULATORY REQUIREMENTS IN DIAGNOSTIC RADIOLOGY & IMAGING ,ACT AND RULES,REGULATIONS FOR JCI,NABH,NABHR

Credits: 4

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of Various Regulatory requirements in diagnostic radiology & Imaging.It also includes Rules & Regulations for JCI,NABH &NABHR.

Course Outcomes (CLO)

CO1: Knowledge about Regulatory Bodies & regulatory Requirements.

CO2: Study about Responsibilities of licenses, registrants & employers and Enforcement of Regulatory requirements.

CO3: Study about Role of Radiographer in Planning.

CO4: Study about Personnel and area monitoring.

CO5: Learn about Planning of X-ray rooms & dark rooms.

Course Content

Unit I

Regulatory Bodies & regulatory Requirements: International Commission on Radiation Protection (ICRP) / National Regulatory body (AERB - Atomic Energy Regulatory Board) - Responsibilities, organization, Safety Standard, Codes and Guides.

Unit II

Responsibilities of licenses, registrants & employers and Enforcement of Regulatory requirements.

Unit III

Role of Radiographer in Planning, QA & Radiation Protection: Role of technologist in radiology department.

Unit IV

Personnel and area monitoring., Setting up of a new X-Ray unit, staff requirement, AERB specifications for site planning and mandatory guidelines

Lipoproteins -Types, composition, role and significance in disease.

Unit V

Planning of X-ray rooms, dark rooms – Inspection of X-Ray installations - Registration of X-Ray equipment installation- Certification

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan .

Core Course:

**RIT424: REGULATORY REQUIREMENTS IN DIAGNOSTIC RADIOLOGY & IMAGING ,ACT AND
RULES,REGULATIONS FOR JCI,NABH,NABHR LABORATORY**

Credits: 2

LTP 004

Course Description: The purpose of this course is to enable understanding of Various Regulatory requirements in diagnostic radiology & Imaging.It also includes Rules & Regulations for JCI,NABH & NABHR.

Course Outcomes (CLO)

CO1: Visit in hospital.

CO2: Know about AERB safety code and ethics.

CO3: Know about Patient Protection-Safe work practice in diagnostic radiology.

CO4: Study about Radiation emergencies- situation handling.

LIST OF PRACTICAL

- Visit in hospital to know-
- AERB safety code and ethics
- Patient Protection-Safe work practice in diagnostic radiology-Radiation emergencies- situation handling.

SEMESTER V

Core Course:

RIT501: QUALITY ASSURANCE & RADIATION SAFETY (AERB Guidelines) IN DIAGNOSTIC

RADIOLOGY

Credits: 04

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of Quality Assurance & Radiation Safety in Diagnostic Radiology.

Course Outcomes (CLO)

CO1: Know About Quality Assurance and quality control of Modern Radiological and Imaging Equipment.

CO2: Understand the Quality Assurance and quality control of Computed Tomography.

CO3: Earn the knowledge about Quality Assurance and quality control of Magnetic Resonance Imaging.

CO4: Know About Quality Assurance and quality control of Ultrasonography.

CO5: Study about the Image artifacts their different types, causes and remedies.

Course Content

Unit I

Quality Assurance and quality control of Modern Radiological and Imaging Equipment Digital Radiography with Radiographic QA procedures, Daily Procedures, Weekly Procedures, Monthly Procedures.

Unit II

Quality Assurance and quality control of Modern Radiological and Imaging Equipment Computed Tomography QA procedures, Daily Procedures, Weekly Procedures, Monthly Procedures.

Unit III

Quality Assurance and quality control of Modern Radiological and Imaging Equipment Magnetic Resonance Imaging QA procedures, Daily Procedures, Weekly Procedures, Monthly Procedures.

Unit IV

Quality Assurance and quality control of Modern Radiological and Imaging Equipment
Ultrasonography QA procedures, Daily Procedures, Weekly Procedures, Monthly Procedures.

Unit V

Image artifacts their different types, causes and remedies, Newer Radiation safety protocols
and recent advances in radiation safety including AERB guidelines.

Books Recommended-

1. Radiology for residents and technicians by Dr.s.k.bhargava.
2. The physics of radiology and imaging by K thayalan

Core Course

RIT521: QUALITY ASSURANCE & RADIATION SAFETY (AERB Guidelines) IN DIAGNOSTIC RADIOLOGY LABORATORY

Credits : 04

LTP 002

Course Description: The purpose of this course is to enable understanding of Quality Assurance & Radiation Safety in Diagnostic Radiology.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Know About Quality Assurance and quality control of Modern Radiological and Imaging Equipment which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and PACS related.

CO2: Understand the Image artifacts their different types, causes and remedies, Newer Radiation safety protocols and recent advances in radiation safety including AERB guidelines.

PRACTICAL OF PRACTICALS:

Working on-

Quality Assurance and quality control of Modern Radiological and Imaging Equipment which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and PACS related.

Image artifacts their different types, causes and remedies, Newer Radiation safety protocols and recent advances in radiation safety including AERB guidelines.

Core Course:

RIT502: HOSPITAL PRACTICE & CARE OF PATIENT

Credits: 04

LTP 400

Course Description: The purpose of this course is to enable understanding of the modes and methods for care of patients.

Course Outcomes (CLO)

CO1: Know About Hospital staffing and administration, records, professional, ethics.

CO2: Understanding Methods of effective communication.

CO3: Know about various Elementary personal and departmental hygiene.

CO4: Study about various types of Moving chair and stretcher.

CO5: Study about Administration of drugs and contrast media.

Course Content

Unit I

Hospital staffing and administration, records, professional, ethics, co-operation with other staff and departments, Departmental organisations. Handling of the patients, seriously ill and traumatized patients, visually impaired, speech and hearing impaired, mentally impaired, drug addicts and non-English speaking patients. Understanding patient needs - patient dignity of inpatient and out patients. Interaction with the patient's relatives and visitors.

Unit II

Methods of effective communication - verbal skills, body language, professional appearance, visual contact etc.

Unit III

Elementary personal and departmental hygiene, dealing with receptacles, bed pans and urinaletc. General preliminaries to the exam.

Unit IV

Moving chair and stretcher, patient. Unconscious patient, general comfort and reassurance for the patient. Vital signs and oxygen - patient's Hemostasis status. Body temp, respiratory rate, pulse, blood pressure, oxygen therapy, oxygen devices, Chest tubes and lines.

Unit V

Administration of drugs and contrast media. Aseptic and sterile procedures. Handling of infections patients in the department or in the ward. Regulation of dangerous drugs. Trolley set up for special x-ray examinations.

Books Recommended-

1. Patient care in radiography by Ruth ann ehruch.

Core Course

RIT522: HOSPITAL PRACTICE & CARE OF PATIENT LABOATORY

Credits : 02

LTP 004

Course Description: The purpose of this course is to enable understanding of the modes and methods for care of patients.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Understand Community Outreach Programme.

CO2: Understand Patient Transferring Techniques.

CO3: Know about Dressing & Undressing Techniques.

CO4: Study about Administration of drugs and contrast media.

LIST OF PRACTICALS

- 1.Community Outreach Programme.
- 2.Patient Transferring Techniques.
- 3.Dressing & Undressing Techniques.
- 4.Administration of drugs and contrast media.

Core Course:

RIT503: NUCLEAR MEDICINE

Credits: 04

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of role of Nuclear Medicine in Radiology.

Course Outcomes (CLO)

CO1: Study about NMT and Radioactive Transformation.

CO2: To Study about Production of Radio nuclides Reactor produced radionuclide.

CO3: To Study about Radio pharmacy & Handling & Transport of Radio-nuclides.

CO4: To study about Safe handling of radioactive materials.

CO5: Study about Equipment's of NMT.

Course Content

Unit I

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.

Unit II

Production of Radio nuclides Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators.

Unit III

Radio pharmacy & Handling & Transport of Radio-nuclides Cold kits, Radio pharmacy used in Nuclear medicine, Radiopharmaceuticals used in various procedures.

Unit IV

Safe handling of radioactive materials, Procedures for handling spills

Unit V

Equipment's of NMT Gamma camera, PET, SPECT (working principle)

Recommended Books:

1. Textbook of radiotherapy: radiation physics, therapy, and oncology by Bomford ck, miller j, kunkler h, sherriff ih, bomford sb, ih kunkler sb. Walter and miller's.

Skill Enhanced Course
BCA101: Computer Fundamentals & IT
Credits : 03
LTP 300

Course Description: The course aims to equip the students with various Office Automation Tools like Word processor, Spreadsheet program & Presentation program. The course includes Crafting professional word documents; excel spread sheets, power point presentations using the Microsoft suite of office tools.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Use various Office Automation Tools like Word processor, Spreadsheet software & Presentation software.

Learn the fundamental of processing unit and operating system.

CO2: Understand various peripheral devices like Input and Output devices of Computer systems, online storage devices. Perform documentation, accounting operations, presentation skills. CO3- Study to use the Internet safely, legally, and responsibly

Course Content

Unit I

Introduction to Computers: Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display), Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication): Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication. Functional Units of Computer System: CPU, registers, system bus, main memory unit Types of Memory (Primary and Secondary) RAM, ROM, PROM, EPROM, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Unit II

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks. Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples. Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples. Operating System and Services in O.S., Types of O.S. DOS: History, Files and Directories, Internal and External Commands, Batch Files.

Unit III

Word Processing: Typing, Editing, Proofing & Reviewing, Formatting Text & Paragraphs, Automatic Formatting and Styles, working with Tables, Graphics and Frames, Mail Merge, Automating Your Work & printing Documents. Excel Spreadsheet: Working & Editing in Workbooks, Creating Formats & Links, formatting a Worksheet & creating graphic objects, Creating Charts (Graphs), formatting and analyzing data, Organizing Data in a List (Data Management), Sharing & Importing Data, Printing.

Unit IV

PowerPoint Presentations: Getting started in PowerPoint, creating a presentation, Creating & editing slides, previewing a slide show, adding picture & graph, adding sound & video, adding auto shape, Animating objects. Electronic Payment System: Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority.

Recommended Books / Suggested Readings:

1. "Computers Today", D. H. Sanders, Fourth Edition, McGraw Hill, 1988.
2. Fundamental of Computers – By V. Rajaraman B.P.B. Publications.
3. "Fundamental of Computers – By P.K. Sinha.
4. MS-Office 2000 (For Windows) – By Steve Sagman.

Core Course

RIT504: RESEARCH METHODOLOGY AND BIOSTATISTICS

Credits : 04

LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of interventions using radiological techniques. It will also include the modes and methods for care of patients.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Introduction to Research Methodology & identifying research problems.

CO2: Study about Ethical problems in Research & Research Design.

CO3: Know about research tools & data Collection methods.

CO4: Study about Biostatistics & understanding of data in Biostatistics.

CO5: Study the relation between data and variables & types of Variables. .

Course Content

Unit I

Rationale: The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

Unit II

Research Methodology:

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Basic Concepts of Biostatistics
6. Types of Data.

Unit III

Research tools and Data collection methods, Sampling methods, Developing a research proposal.

Unit IV

Biostatistics:

1. Need of biostatistics
2. What is biostatistics: beyond definition
3. Understanding of data in biostatistics
4. How & where to get relevant data
5. Relation between data & variables
6. Type of variables: defining dataset
7. Collection of relevant data: sampling methods

Unit V

Construction of study: population, sample, normality and its beyond (not design of study, perhaps), Summarizing data on the pretext of underlined study, Understanding of statistical analysis (not methods)

Suggested readings

1. Statistical Methods by S.P. Gupta
2. Methods in biostatistics for medical students by B.K. Mahajan
3. RPG Biostatistics by Himanshu Tyagi

SEMESTER VI
Core Course
RIT001: INTERNSHIP
Credits : 25
LTP 00600

INTERNSHIP

INTERNSHIP SCHEDULE-

S.NO	Postings	Duration
1	Conventional Radiography/Digital Radiography	1 Month
2	Radiographic Special Procedures	1 Month
3	Ultrasound	1 Month
4	Computed Tomography	1 Month
5	Magnetic Resonance Imaging	1 Month
6	Nuclear Medicine	1 Month

SEMESTER VII
Core Course:
RIT701: INTERVENTION RADIOLOGICAL TECHNIQUES AND CARE OF PATIENT
Credits: 04
LTP 400

THEORY

Course Description: The purpose of this course is to enable understanding of interventions using radiological techniques. it will also include the modes and methods for care of patients

Course Outcomes (CLO)

CO1: Understand about the interventions using radiological techniques. it will also include the modes and methods for care of patients.

CO2: Know about angiography and DSA.

CO3: Understand the diagnostic procedure angiography, angioplasty.

CO4: Know about various types of angiographies.

CO5: Understand the Care of patient in Interventional Radiology

Course Content

Unit I

Basic Angiography and DSA: History, technique, patient care, Percutaneous catheterization, catheterization sites, Asepsis, Guide wire, catheters, pressure injectors, accessories, Use of digital subtraction single plane and bi-plane.

Unit II

Diagnostic procedures : Angiography, angioplasty, biliary examination, renal evaluation and drainage procedure and aspiration cytology under fluoro, CT, US, MRI guidance.

Unit III

Central Nervous System: Myelography. Cerebral studies, Ventriculography. Arthrography: Shoulder, Hip, Knee, Elbow

Unit IV

Angiography: Carotid Angiography (4 Vessel angiography).Thoracic and Arch Aortography. Vertebral angiography, femoral arteriography. Selective studies: Renal, SMA, Coeliac axis. Angiocardiology.

Venography: Peripheral venography, Cerebral venography, Inferior and superior

venocavography. Relevant visceral phlebography.

Unit V

Care of Patient in Interventional Radiology

Introduction to patient care: responsibilities of healthcare facility-responsibilities of the imaging technologist. General patient care, patient transfer technique-restraint techniques-aspects of patient comfort-specific patient conditions-security of patient property-obtaining vital signs laying up a sterile trolley-assisting in IV injection.

Text-Books:

1. Radiology for residents and technicians by Dr.S.k. Bhargava.
2. Basics of Mri by Catherine.
3. Ct by Seerum.

Core Course:

RIT721: INTERVENTION RADIOLOGICAL TECHNIQUES AND CARE OF PATIENT

LABORATORY

Credits: 02

LTP 004

Course Description: The purpose of this course is to enable understanding of interventions using radiological techniques. it will also include the modes and methods for care of patients

Course Outcomes (CLO)

CO1: understand the interventions using radiological techniques. it will also include the modes and methods for care of patients.

CO2: understand the diagnostic procedure Catheterization.

CO3: Know about Contrast media .

List of Practicals

1. Handling and Care of patient during Intervention radiological procedures.
2. Care of Patient in Interventional Radiology
3. Catheterization.
4. Contrast media.

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CORE COURSE
RIT702: CT PROCEDURES
Credits : 04
LTP 400 THEORY

Course Description: The purpose of this course is to enable understanding of Various procedures of CT.

Course Learning Outcomes(CLO):

CO1: Know about various procedures of abdomen.

CO2: Understand the general Imaging methods of head.

CO3: Understand the various procedures of CT Thoracic.

CO4: Know about the various CT guided procedures.

CO5: Understand the Imaging Techniques of CT guided procedures.

Course Content:

Unit I

Abdominopelvic CT

General abdomen and pelvic scanning methods, Organ specific consideration, CT Colonography, CT Enterography, CT Urography, Protocol development for specific Abdominopelvic applications, Abdomen and pelvic Protocols.

Unit II

Neurologic Imaging Procedures

General imaging methods for Head, Neck protocols, CTA of the head and neck, CT Perfusion of Head, CT Sinuses, Specific Neurological Protocols, Neurological protocols.

Unit III

Thoracic Imaging Procedures

General thoracic scanning methods, CT of the airways, High resolution CT, thoracic CTA, Cardiac CT, Cardiac CT for Calcium Scoring, Coronary CTA Thoracic Protocols. .

Unit IV

Musculoskeletal Imaging Procedures

General Musculoskeletal scanning methods, Musculoskeletal protocols.

Interventional CT and CT Fluoroscopy

Imaging Techniques For Ct guided procedures, Indications for CT guided procedures, CT

guided Biopsies, CT guided fluid aspiration and abscess drainage.

Health services at fairs and festivals

Removal and disposal of refuse and excreta. Sanitary drainage fittings

Recommended Books

1. Radiology for residents and technicians by Satish K. Bhargva

2. Computed tomography by Lois E. Roman

3. O Nalcioğlu, RY Lou-physics in Medicine and biology

4. WD-McDavid, RG Waggener, Wh Payre, -Medicine-

5. Dr. Joremy and Dr. David cuetw et al.

CORE COURSE
RIT703: NUCLEAR MEDICINE PHYSICS
Credits : 04
LTP 400

THEORY:

Course Description: The purpose of this course is to enable understanding of nuclear medicine physics.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Understand about the Nuclear medicine physics. It will also include the electromagnetic spectrum.

CO2: Understand about the Electricity, Magnetism and Electromagnetic induction. It will also include the Coulomb law-unit of charge-resistance-ohms law electric power & Joules law.

CO3: Know about the Voltmeter, Ammeter & Multimeter. Radiation Units & Quantities.

CO4: Understand about the Radioactivity & Interaction of Radiation.

CO5: Understand about the Radiation quality – law of exponential attenuation.

Course Content :

Unit I

Nuclear medicine physics Basics: Elementary introduction to structure of matter-elements-compounds and mixtures-molecules and atoms-Atomic & Nuclear structures-Atomic models – Periodic table -Mass energy equivalence – Fluorescence – Phosphorescence – luminescence -electromagnetic spectrum.

Unit II

Electricity, Magnetism and Electromagnetic induction: Electricity in ionized gases electric charges electric induction-Coulomb law-unit of charge-resistance-ohms law electric power-Joules law.

Unit III

Magnetism-magnetic properties-electromagnetic effect electrical instruments like Voltmeter, Ammeter & Multimeter. Radiation Units & Quantities.

Unit IV

Radioactivity & Interaction of Radiation: Radioactivity -Discovery– Natural & Artificial Radioactivity-Isotopes and nuclides – binding forces between nuclear particles –alpha & beta

particles – gamma radiation -mechanisms of radioactive decay – half life -Interaction of electrons, X-Ray production, X-rays & γ interaction with matter -Radiation intensity & exposure -radiation dose

Unit V

Radiation quality – law of exponential attenuation – half value layer – linear attenuation coefficient – Scattering – photoelectric effect – Compton-scattering – pair production – particle interactions – total attenuation coefficient- relative clinical importance.

Recommended Books:

1 Physics in Nuclear Medicine – Simon Cherry, James Sorenson & Michael Phelps.

2 Basic Medical Radiation physics: Stanton

3 Medical Radiation Physics – William R. Hendee.

4 Basics of Computers and Image hard copy production in Nuclear Medicine.

CORE COURSE

RIT704: MRI PROCEDURES

Credits : 04

LTP 400

THEORY:

Course Description: The purpose of this course is to enable understanding of the MRI Procedures.

Course Outcomes (CLO): Through this course student should be able to:

CO1: Understand about the general imaging methods for MRI Brain & Neck.

CO2: Understand about the MRI abdomen and pelvic.

CO3: Know about the thoracic scanning methods.

CO4: Understand about the upper extremities scanning methods.

CO5: Understand about the Lower extremities scanning methods.

Course Content :

Unit I

MRI for Brain and Neck

General imaging methods for Brain, Protocol for Temporal lobes, Protocol for Posterior fossa and internal auditory meati, Protocol for Pituitary fossa, Protocol for Orbits, Protocol for Paranasal sinuses, Protocol for Pharynx Larynx, Protocol for Thyroid and parathyroid glands, Protocol for Salivary glands, Protocol for Temporomandibular joints, Protocol for Vascular imaging.

Unit II

MRI For Abdomin & pelvic

General abdomen and pelvic scanning methods, Protocol for Liver and biliary system, Protocol for Kidneys and adrenal glands, Protocol for Pancreas, Protocol for Vascular imaging, Protocol for Male pelvis, Protocol for Female pelvis, Protocol for Obstetrics.

Unit III

MRI For Thoracic Imaging

General thoracic scanning methods, Protocol for Lungs and mediastinum, Protocol for Heart and great vessels, Protocol for Thymus, Protocol for Breast, Protocol for Axilla, Protocol for Brachial plexus.

Unit IV

MRI For lower Limbs

General Lower extremities scanning methods, Protocol for Hips, Protocol for Femur, Protocol for Knee, Protocol for Tibia and fibula, Protocol for Ankle, Foot, Protocol for Vascular imaging.

Unit V

MRI For lower Limbs

General Lower extremities scanning methods, Protocol for Hips, Protocol for Femur, Protocol for Knee, Protocol for Tibia and fibula, Protocol for Ankle, Foot, Protocol for Vascular imaging.

Recommended Books:

1.Rad Techs's Guide to MRI ,Imaging Procedures by Carolyn Roth.

SKILL ENHANCED II
RIT705: FIRST AID
Credits : 3
LTP 300

THEORY

Course Description: The purpose of this course is to enable understanding of Various first Aid techniques and Management.

Course Learning Outcomes(CLO):

CO1: Study about the Aims & objectives of First Aid.

CO2: Learn about First-Aid for Respiratory & Cardiac Conditions.

CO3: Study about Wounds & Injuries & their Management & dressings.

CO4: Study about First Aid for Fractures, Dislocation & various neurological Conditions.

CO5: Learn about First Aid of Drug toxicity, Poisoning, Bites & Stings etc. .

Course Content:

Unit I

First aid: Aims and objectives of first aid

Unit II

Basic first aid techniques on

1. Respiratory system & breathing
2. Cardiac condition, blood circulation & Shock
3. Wounds & injuries
4. Dressing and bandages
5. Fractures & dislocation of the bone & joints.
6. Abnormality of the gastrointestinal tract & food poisoning
7. Electric shock; burns, hemorrhage.
8. Bites & stings

Unit III

Neurological conditions & unconsciousness

Unit IV

Drug toxicity & poisoning

Unit V

Foreign body in ENT & Skin

SEMESTER VII
CORE COURSE
RIT002: INTERNSHIP
Credits : 26
LTP 0026

INTERNSHIP SCHEDULE

S.No.	Postings	Duration
	On the behalf of the Specialization opted by the student ,Six months internship will be there in the concerned field of Specialization.	06 Months

RIT003: PROJECT REPORT**Credits : 10****LTP 0010****PROJECT REPORT**

Students have to carry out a research project (on any topic related to radiology) under the supervision of a faculty/hospital administration. The project report has to be prepared on the basis of the research work carried out. The assessment is done on the basis of the work done and the presentation and viva.