



**ROYAL SCHOOL OF MEDICAL & ALLIED SCIENCES
(RSMAS)**

**DEPARTMENT OF RADIOGRAPHY & ADVANCE IMAGING
TECHNOLOGY**

**COURSE STRUCTURE & SYLLABUS
(BASED ON NATIONAL EDUCATION POLICY 2020)**

FOR

**B.Sc. IN RADIOGRAPHY & ADVANCE IMAGING TECHNOLOGY
(4 YEARS SINGLE MAJOR)**

W.E.F

AY - 2024 – 25

COURSE STRUCTURE OF THE FRAMEWORK

Semester wise and component wise distribution of credit (Four Year UGP - Single Major)

Year	Semester	Component	Couse code	Number of Courses	Credit per Course	Total credit in the component
First Year	I	Major (Core)	C-101, C-102	2	3	6
		Minor	M-101	1	3	3
		Interdisciplinary	IDC-1	1	3	3
		AEC1- Language	AEC-1	1	2	2
		SEC- (To choose from a pool of courses. To be related to Major)	SEC-1	1	3	3
		VAC- (To choose from a pool of courses)	VAC-1	1	3	3
					7	
	II	Major (Core)	C-103, C-104	2	3	6
		Minor (May or may not be related to major)	M102	1	3	3
		Interdisciplinary	IDC-2	1	3	3
		AEC1- Language	AEC-2	1	2	2
		SEC (To choose from a pool of courses. To be related to Major)	SEC-2	1	3	3
		VAC- (Choose from a pool of courses)	VAC-2	1	3	3
				7		20
	III	Major (Core)	C-201, C-202	2	4	8

Second Year		Minor (May or may not be related to major)	M-201	1	4	4
		Interdisciplinary	IDC-3	1	3	3
		AEC1- Language	AEC-3	1	2	2
		SEC- (To choose from a pool of courses. To be related to Major)	SEC-3	1	3	3
				6		20
IV		Major (Core)	C-203, C-204, C-205	3	4	12
		Minor (May or may not be related to major)	M-202, M-203	2	3	6
		AEC1- Language	AEC-4	1	2	2
				6		20
Year	Semester	Component	Couse code	Number of Courses	Credit per Course	Total credit in the component
Third Year	V	Major (Core)	C-301, C-302, C-303	3	4	12
		Minor (May or may not be related to major)	M-301	1	4	4
		Internship		1	4	4
				5		20
	VI	Major (Core)	C-304, C-305, C-306, C-307	4	4	16
Minor		M-302	1	4	4	
				5		20
	VII	Major (Core)	C-401, C-402, C-403, C-404	4	4	16

Fourth Year		Minor (May or may not be related to major)	M-401	1	4	4	
				5		20	
	VIII		Major (Core)	C-405 (RM301)	1	4	4
			Research Methodology	M-402	1	4	4
			Dissertation/Research Project		1	12	12
			Or 400 level advanced course Core (in lieu of Dissertation/Research Project)	C-407, C-408, C-409	3	4	
				3/5		20	

GRADUATE ATTRIBUTES & LEARNING OUTCOMES

6.1. Introduction:

As per the NHEQF, each student on completion of a programme of study must possess and demonstrate the expected **Graduate Attributes** acquired through one or more modes of learning, including direct in-person or face-to-face instruction, online learning, and hybrid/blended modes. The graduate attributes indicate the quality and features or characteristics of the graduate of a programme of study, including learning outcomes relating to the disciplinary area(s) relating to the chosen field(s) of learning and generic learning outcomes that are expected to be acquired by a graduate on completion of the programme(s) of study.

The graduate profile/attributes must include,

- capabilities that help widen the current knowledge base and skills,
- gain and apply new knowledge and skills,
- undertake future studies independently, perform well in a chosen career, and

- play a constructive role as a responsible citizen in society.

The graduate profile/attributes are acquired incrementally through development of cognitive levels and describe a set of competencies that are transferable beyond the study of a particular subject/disciplinary area and programme contexts in which they have been developed.

Graduate attributes include,

- **Learning outcomes that are specific to disciplinary areas** relating to the chosen field(s) of learning within broad multidisciplinary/interdisciplinary/ transdisciplinary contexts.
- **Generic learning outcomes** that graduate of all programmes of study should acquire and demonstrate.

6.2. Graduate Attributes:

Table: 7: The Learning Outcomes Descriptors and Graduate Attributes

Sl.no.	Graduate Attribute	The Learning Outcomes Descriptors (The graduates should be able to demonstrate the capability to:)
GA1	Disciplinary Knowledge	acquire knowledge and coherent understanding of the chosen disciplinary/interdisciplinary areas of study.
GA 2	Complex problem solving	solve different kinds of problems in familiar and non-familiar contexts and apply the learning to real-life situations.
GA 3	Analytical & Critical thinking	apply analytical thought including the analysis and evaluation of policies, and practices. Able to identify relevant assumptions or implications. Identify logical flaws and holes in the arguments of others. Analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.

GA 4	Creativity	create, perform, or think in different and diverse ways about the same objects or scenarios and deal with problems and situations that do not have simple solutions. Think ‘out of the box’ and generate solutions to complex problems in unfamiliar contexts by adopting innovative, imaginative, lateral thinking, interpersonal skills, and emotional intelligence.
GA 5	Communication Skills	listen carefully, read texts and research papers analytically, and present complex information in a clear and concise manner to different groups/audiences. Express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media.
GA 6	Research-related skills	develop a keen sense of observation, inquiry, and capability for asking relevant/ appropriate questions. Should acquire the ability to problematize, synthesize and articulate issues and design research proposals, define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict cause-and-effect relationships. Should develop the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work.
GA 7	Collaboration	work effectively and respectfully with diverse teams in the interests of a common cause and work efficiently as a member of a team.

GA 8	Leadership readiness/qualities	plan the tasks of a team or an organization and setting direction by formulating an inspiring vision and building a team that can help achieve the vision.
GA 9	Digital and technological skills	use ICT in a variety of learning and work situations. Access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.
GA 10	Environmental awareness and action	mitigate the effects of environmental degradation, climate change, and pollution. Should develop the technique of effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

6.3 Programme Learning Outcomes (PLO)

The outcomes described through learning outcome descriptors in Table 6 are attained by students through learning acquired on the completion of a programme of study relating to the chosen fields of learning, work/vocation, or an area of professional practice. The term ‘programme’ refers to the entire scheme of study followed by learners leading to a qualification. Individual programmes of study will have defined learning outcomes that must be attained for the award of a specific certificate/diploma/degree.

The Departments and Schools of the University are responsible for ensuring that individual programme learning outcomes align with the relevant graduate attributes. Programme learning outcomes (PLOs) include outcomes that are specific to disciplinary areas of learning associated with the chosen field (s) of learning.

The programme learning outcomes would also focus on knowledge and skills that prepare students for further study, employment, and responsible citizenship.

Students graduating with the degree B.Sc. (Radiography & Advance Imaging Technology) will be able to achieve the following:

PROGRAMME OUTCOMES	HEADER	DESCRIPTION
PLO 1	Knowledge of Radiography & Imaging Technology	Possess and acquire scientific knowledge to become a healthcare professional
PLO 2	Develop complex problem-solving skills	Possess skills to solve case-related problems and alteration of imaging parameters depending on the type of patient
PLO 3	Develop analytical & critical thinking skills	Possess qualities to evaluate critical cases, apply proper protocols, and solve real-time problems depending on the patient's scenario
PLO 4	Develop the ability to create	Possess creative skills to deal with difficult scenarios by adopting ingenious ways of achieving the goal without compromising the desired outcome

PLO 5	Develop effective communication skills	Communicate effectively and appropriately with the interdisciplinary healthcare team and with the society
PLO 6	Develop research-related skills	Develop an essence of enquiry and investigation for raising relevant and appropriate questions, synthesizing and articulating them for interpretation of data
PLO 7	Develop team building skills	Exhibit team work skills and mindset to support shared goals with the interdisciplinary healthcare team to improve societal health
PLO 8	Develop leadership qualities	Display entrepreneurship, leadership and mentorship skills to practice independently as well as in collaboration with the interdisciplinary health care team

PLO 9	Develop digital and technological skills	Possess technical, information, and communications skills to provide quality health care services using a variety of software applicable as necessary
PLO 10	Create environmental awareness and the ability to address the issues	Possess knowledge and technicality to raise awareness for the benefit of society and maintain proper aspects of radiation safety for patients as well as public

Upon completion of this course the student should be able to:

COURSE LEARNING OUTCOMES	DESCRIPTION
PSO 1	Know and demonstrate understanding of the concepts of physics and other
PSO 2	Capable of analyzing various situations and use proper technique applicable according to the need of the patient.
PSO 3	Develop the knowledge, skills and technology necessary for obtaining good quality images which will aid in the process of diagnosis.
PSO 4	Apply the various technical and analytical knowledge in creation of good radiographs and other high quality imaging films

6.5 The Qualification Specifications:

Table: 8: NHEQF Qualification Specifications

Qualification type	Purpose of the qualification
Undergraduate Certificate	The students will be able to apply technical and theoretical concepts and specialized knowledge and skills in a broad range of contexts to undertake skilled or paraprofessional work and/or to pursue further study/learning at higher levels.
Undergraduate Diploma	The students will be able to apply specialized knowledge in a range of contexts to undertake advanced skilled or paraprofessional work and/or to pursue further learning/study at higher levels.
Bachelor's degree	The students will be able to apply a broad and coherent body of knowledge and skills in a range of contexts to undertake professional work and/or for further learning.
Bachelor's degree (Honours/ Honours with Research)	The students will be able to apply the knowledge in a specific context to undertake professional work and for research and further learning.
	The students will be able to apply an advanced body of knowledge in a range of contexts to undertake professional work and apply specialized knowledge and skills for research and scholarship, and/or for further learning relating to the chosen field(s) of learning, work/vocation, or professional practice.

Teaching Learning Process

Teaching and learning in this programme involves classroom lectures as well as tutorial and remedial classes.

Tutorial classes: Tutorials allow closer interaction between students and teacher as each student gets individual attention. The tutorials are conducted for students who are unable to achieve average grades in their weekly assessments. Tutorials are divided into three categories, viz. discussion-based tutorials (focusing on deeper exploration of course content through discussions and debates), problem-solving tutorials (focusing on problem-solving processes and quantitative reasoning), and Q&A tutorials (students

ask questions about course content and assignments and consolidate their learning in the guiding presence of the tutor).

Remedial classes: The remedial classes are conducted for students who achieve average and above average grades in their weekly assessments. The focus is laid to equip the students to perform better in the exams/assessments. The students are divided into small groups to provide dedicated learning support. Tutors are assigned to provide extra time and resources to help them understand concepts with advanced nuances. Small groups allow tutors to address their specific needs and monitor them.

The following methods are adopted for tutorial and remedial classes:

- Written assignments and projects submitted by students
- Project-based learning
- Group discussions
- Home assignments
- Class tests, quizzes, debates organised in the department
- Seminars and conferences
- Extra-curricular activities like cultural activities, community outreach programmes etc.
- Field trip, excursions, study tour, interacting with eminent authors, etc.

1.8 Assessment Methods

	Component of Evaluation	Marks	Frequency	Code	Weightage (%)
A	Continuous Evaluation				
I	Analysis/Class test	Combination of any three from (i) to (v) with 5 marks each	1-3	C	25%
Ii	Home Assignment		1-3	H	
Iii	Project		1	P	
Iv	Seminar		1-2	S	
V	Viva-Voce/Presentation		1-2	V	
Vi	MSE		MSE shall be of 10 marks	1-3	

Vii	Attendance	Attendance shall be of 5 marks	100%	A	5%
B	Semester End Examination		1	SEE	70%
	Project				100%

BACHELOR DEGREE IN RADIOGRAPHY & ADVANCE IMAGING TECHNIQUE

PROGRAMME STRUCTURE

BRIT 1ST SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M101/ RIT242M111	ANATOMY-I (Theory+ Lab)	100	3
2	RIT242M102/ RIT242M112	PHYSIOLOGY-I (Theory+ Lab)	100	3
MINOR STREAM				
3	RIT242N101	INTRODUCTION TO RADIOGRAPHY	100	3
ABILITY ENHANCEMENT COURSES (AEC)				
4	CEN982A101 BHS982102	COMMUNICATIVE ENGLISH & BEHAVIOURAL SCIENCE-I	100	2
INTER-DISCIPLINARY COURSES (ID)				
5	IKS992K101	IKS-I	100	3
SKILL ENHANCEMENT COURSE (SEC)				
6	RIT242S101	BIOCHEMISTRY	100	3
VALUE ADDED COURSE(VAC)				
7	VAC-I	Students will be choosing from a basket of courses	100	3

		TOTAL		20
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BRIT 2ND SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M201/ RIT242M211	ANATOMY-II (Theory+ Lab)	100	3
2	RIT242M202 RIT242M212	PHYSIOLOGY-II (Theory+ Lab)	100	3
MINOR STREAM				
3	RIT242N201	BASICS OF ANATOMY & PHYSIOLOGY	100	3
ABILITY ENHANCEMENT COURSES (AEC)				
4	CEN982A201 BHS982A202	COMMUNICATIVE ENGLISH & BEHAVIOURAL SCIENCE-II	100	2
INTER-DISCIPLINARY COURSES (ID)				
5	IKS992K201	IKS-II	100	3
SKILL ENHANCEMENT COURSE (SEC)				
6	RIT242S201	HOSPITAL DUTY & PATIENT CARE	100	3
VALUE ADDED COURSE(VAC)				
7	VAC-II	Students will choose from a basket of courses	100	3
		TOTAL		20

BRIT 3rd SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M301/	BASIC PHYSICS	200	4

	RIT242M311			
2	RIT242M312	GENERAL RADIOGRAPHIC TECHNIQUE	200	4
3	RIT242M303	DARKROOM TECHNIQUE	200	4
ABILITY ENHANCEMENT COURSES (AEC)				
4	CEN982A301 BHS982A302	COMMUNICATIVE ENGLISH & BEHAVIOURAL SCIENCE-III	200	2
INTER-DISCIPLINARY COURSES (ID)				
5		Students will choose from a basket of courses	200	3
SKILL ENHANCEMENT COURSE (SEC)				
6	RIT242S311	COMPUTER SKILLS	200	3
		TOTAL		20
BRIT 4TH SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M401	PHYSICS OF RADIOLOGY	200	4
2	RIT242M412	SPECIAL RADIOGRAPHIC PROCEDURES	200	4
3	RIT242M403	RADIATION HAZARDS AND PROTECTION	200	4
4	RIT242M404	PATIENT CARE AND MANAGEMENT	200	3
5	RIT242M405	BASICS OF PATHOLOGY	200	3
ABILITY ENHANCEMENT COURSES (AEC)				
6	CEN982A401 BHS982A402	COMMUNICATIVE ENGLISH & BEHAVIOURAL SCIENCE-IV	200	2
		TOTAL		20

BRIT 5TH SEMESTER

SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M501	COMPUTED TOMOGRAPHY	300	4
2	RIT242M502	TECHNIQUES OF MAMMOGRAPHY & FLUOROSCOPY	300	4
3	RIT242M503	BASICS OF ULTRASOUND	300	4
4	RIT242M504	PHARMACOLOGY	300	4
5	RIT242M505	MEDICAL LAW AND ETHICS	300	4
		TOTAL		20

BRIT 6TH SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M601	MAGNETIC RESONANCE IMAGING	300	4
2	RIT242M602	BASICS OF RADIOTHERAPY	300	4
3	RIT242M603	BIOSTATISTICS AND RESEARCH METHODOLOGY	300	4
4	RIT242M604	INTERVENTIONAL RADIOLOGY	300	4
INTERNSHIP				
5	RIT242M624	CLINICAL POSTING	300	4
		TOTAL		20

BRIT 7TH SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				

1	RIT242M711	TECHNIQUES OF ROUTINE X-RAYS	400	5
2	RIT242M712	TECHNIQUES OF SPECIAL X-RAYS	400	4
3	RIT242M713	TECHNIQUES OF ULTRASOUND	400	4
4	RIT242M714	TECHNIQUES OF MAMMOGRAPHY	400	4
5	RIT242M714	TECHNIQUES OF FLUOROSCOPY	400	4
		TOTAL		21

BRIT 8TH SEMESTER				
SL.NO.	SUBJECT CODE	NAMES OF SUBJECTS	COURSE LEVEL	CREDITS
MAJOR STREAM				
1	RIT242M811	TECHNIQUES OF CT	400	7
2	RIT242M812	TECHNIQUES OF MRI	400	8
RESEARCH PROJECT				
5	RIT242M823	MAJOR PROJECT/DISSERTATION	400	12
		TOTAL		27

Level: Semester I

Title of the Paper: ANATOMY- I	Course: C-101 (Major)
Subject Code: RIT242M101/RIT242M111	Course Level: 100
Scheme of Evaluation: Theory + Practical	
L-T-P-C: 2-0-2-3	Total credits: 3

Course Objectives:

This subject is designed to impart fundamental knowledge on the structure of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of anatomy.

Course Outcomes

On successful completion of the course, the students will be able to:		
CO	Course Outcome	Blooms Taxonomy Level
CO 1	Remember the different anatomical structures of the human body.	BT 1
CO 2	Compare various body systems and co-relate the anatomy among them all.	BT 2
CO 3	Apply different laws in assessing various pathological conditions.	BT 3
CO 4	Apply the knowledge of anatomy as necessary in the production of good quality images.	BT 4

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none">● Introduction:● Definition of anatomy and its divisions, Terms of location, positions and planes.● Cell and its organelles, Tissues & its classification, Glands.● Gastro-intestinal System:● Parts of the GIT - mouth, pharynx, oesophagus, stomach● Abdominal cavity - divisions and regions● Liver● Pancreas● Spleen● Gall Bladder	10

	<ul style="list-style-type: none"> • Intestine (small and large) 	
II	<p>Respiratory system:</p> <ul style="list-style-type: none"> • Parts of Respiratory system; Structure of nose, nasal cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments. 	10
III	<ul style="list-style-type: none"> • Musculoskeletal system: • Structure of Bone & its types. • Joints- Classification of joints with examples; details of synovial joint. • Axial skeleton & appendicular skeleton • Bones of appendicular skeleton • Bones of axial skeleton • Locomotor system - bone , cartilage, ligaments and tendons • Muscles & its types 	14
IV	<ul style="list-style-type: none"> • Cardiovascular System: • Arteries & veins, Capillaries & arterioles. • Heart- size, location, chambers, blood supply of heart, pericardium. • Systemic & pulmonary circulation. • Major blood vessels of Heart 	10
TOTAL		44

Text Books :

1. Sembulingam, K., Sembulingam, P. (2012). Essentials of Medical Physiology, 6th Edition, New Delhi: Jaypee brothers medical publishers.
2. Wilson, J.W., Livingstone, K. C. (1987). Anatomy and Physiology in Health and Illness, 6th Revised Edition, New York: Churchill Livingstone.

Reference Books:

1. Tandon, O.P., Tripathi, R. (2011). Best and Tailor's Physiological basis of Medical Practice. 13th Edition. USA: Williams & Wilkins
2. Arthur, C. Guyton., Hall, E. J. (2011). Text book of Medical Physiology. 12th Edition. USA: Elsevier's.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
30 NCH	30 NCH	30 NCH Lab visit - Home assignments - Projects

ANATOMY-I LAB

Credit: 1

Objectives: The objective of the course is to introduce students to the practical gained regarding the anatomy of various structures and the histological appearance of various organs of the human body. Identification of the upper limb bones and their features.

DETAILED SYLLABUS:

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> • Introduction of the human body • To identify different levels of organisation and types of tissues • Study of compound microscope 	4
II	<ul style="list-style-type: none"> • To identify different planes and cavities of the body • To identify the division of the skeleton and the names of the individual bones • To identify commonly used terms of movement • To identify the quadrants and regions of the body 	6
III	<ul style="list-style-type: none"> • To identify humerus • To identify radius • To identify ulna 	10

	<ul style="list-style-type: none"> To identify hand 	
IV	<ul style="list-style-type: none"> To identify Clavicle To identify Scapula 	10
TOTAL		30

Text Books:

- Ross and Wilson (2014), Anatomy and physiology in health and illness, 11th edition, Elsevier publications
- Chaurasia BD, (2016), Human Anatomy , 7th edition, CBS publisher

References:

- Frank. N. Nettar, Atlas of human Anatomy, 7th Edition, Elsevier
- Frederic H. Martini, Judi L.Nath, EdwinFB, Fundamentals of Anatomy and Physiology, 9th edition, pearson publishers.

Level: Semester I

Title of the Paper: PHYSIOLOGY-I	Course: C-102 (Major)
Subject Code: RIT242M102/RIT242M112	Course Level: 100
Scheme of Evaluation: Theory + Practical	
L-T-P-C: 2-0-2-3	Total credits: 3

Course Objectives

This subject is designed to impart fundamental knowledge on the physiology and the functioning of the various systems of the human body. It also helps in understanding the homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of physiology.

Course Outcomes

On successful completion of the course the students will be able to:		
CO	Course Outcome	Blooms Taxonomy Level
CO 1	Understand the normal physiology of the human body and also the reaction of the body with respect to the surrounding.	BT 1
CO2	To demonstrate the understanding and scope of human physiology in real-life situations.	BT 2
CO3	To evaluate how abnormal physiological conditions might affect normal human functioning.	BT 3
CO4	To apply the normal physiological knowledge in assessing abnormal functional findings.	BT 4

DETAILED SYLLABUS:

MODULE	TOPICS & COURSE CONTENT	PERIODS
I	<p>Blood</p> <ul style="list-style-type: none"> • Red Blood Cells- Functions, count, Physiological and pathological variations. Erythropoiesis-stages • Hemoglobin-Functions, Physiological variations. • White Blood cells- Functions, count, morphology. • Platelets-count, morphology, functions. • Hemostasis-Definition, Mechanism, clotting factors. • Blood groups-ABO system, Rh system, Blood transfusion- Indication, transfusion reactions. <p>Anaemias-classification, effects of anaemia on body.</p>	10
II.	<p>Gastrointestinal System</p> <ul style="list-style-type: none"> • Physiological Anatomy, functions of GIT. • Salivary Gland-functions of saliva. 	

	<ul style="list-style-type: none"> • Stomach- structure and functions, Gastric secretions-composition, functions, Mechanism • Pancreas- structure, functions, composition of Pancreatic juice. • Liver-Functions of liver. • Bile-Composition, functions. • Jaundice-Types and its causes. • Gall Bladder- Functions • Intestine- Movements of small and large intestine. • Digestion and Absorption of Carbohydrates, Proteins, Fats. <p>Hormones of GIT- Functions of Gastrin, Secretin, CCK-Pz.</p>	14
III	<p>Cardiovascular System</p> <ul style="list-style-type: none"> • Heart-Physiological Anatomy, Nerve supply • Cardiac Cycle-Events –systole, diastole • Cardiac Output-Definition and factors affecting it. • Heart sounds-normal heart sounds, its causes, areas of auscultations. • Blood Pressure-Definition, normal value, Physiological variations, its measurement. • ECG- normal waves. <p>Shock-Definition, Types.</p>	10
IV	<p>Respiratory System</p> <ul style="list-style-type: none"> • Physiological Anatomy, Functions of the respiratory system. • Types of respiration, respiratory membrane. • Lung volumes and capacities, vital capacity and factors affecting it. • Transport of Oxygen-Forms of transportation, Oxy-hemoglobin dissociation curve and factors affecting it. 	10

	<ul style="list-style-type: none"> • Transport of Carbon-Dioxide- Forms of transportation. • Hypoxia-Definition, types, effects of hypoxia. • Cyanosis-Definition and types. Artificial Respiration- CPR	
	Total	44

Text Books:

1. Arthur, Guyton, Textbook of Medical Physiology, Mosby. 3rd Edition
2. Sembulingam.K, Human Physiology- Vol. 1&2 ,MedicalAllied, 7th Edition.

Reference Books:

3. Chaudhari, S.K ,Concise Medical Physiology, New CentralAgency,Calcutta, 4th Edition
4. Tortora&Grabowski,Harper Collins, Principals of Anatomy and Physiology, Gopal Edition.

CREDIT DISTRIBUTION		
THEORY/TUROTIAL	PRACTICUM	EXPERIENTIAL LEARNING
30 NCH	30 NCH	30 NCH Lab visit - Home assignments - Projects

PHYSIOLOGY-I LAB

Credit: 1

Course Objectives: The objective of the course is to learn about various vitals in normal & the alterations in the physiology of the human body.

DETAILED SYLLABUS:

MODULE	TOPICS & COURSE CONTENT	PERIODS
I	Identification of some laboratory instruments	6
II	Determination of blood hemoglobin level	10
III	Determination of bleeding time Blood pressure measurement	4
IV	Determination of clotting time Blood smear preparation, staining and differential leukocyte count	10
	TOTAL	30

Text Book:

1. Alison,G.Anne,W.(2014). Ross and Wilson Anatomy and Physiology in Health and Illness. Elsevier Health; UK,13th edition.
2. Sembulingam. K, Human Physiology- Vol. 1&2 ,Medical Allied, 7th Edition.

Reference Books:

1. Arthur, Guyton, Textbook of Medical Physiology, Mosby. 4th Edition

Level: Semester I

Title of the Paper: Introduction of Radiography	Course: M-101 (MINOR)
Subject Code: RIT242N101	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 3-0-0-3	Total credits: 3

Course Objectives

This syllabus has been formulated to impart basic knowledge on physics, principles of radiation physics, and methods of protection from radiation.

Course Outcomes

On successful completion of the course, the students will be able to:		
CO	Course Outcome	Blooms Taxonomy Level
CO 1	Remember the key concepts of physics	BT 1
CO2	Demonstrate the structure and functions of a modern-day x-ray tube	BT 2
CO3	Explain the various biological effects of radiation	BT 2
CO4	Analyze various types of equipment to identify leakages and provide protection against it	BT 4

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction- basics of atomic structure & electromagnetic radiation	15
II.	Radiation & types of radiation- Ionizing radiation and non-ionizing radiation, Discovery of X-rays, Production of x-ray, filters & types of filters, Scattered radiations, grid & types of grids	15
III.	The biological effect of radiation	15
IV.	Aim & Principle of Radiation Protection- Concept of ALARA, Cardinal Principle, Role of technologist in the radiology department - Personnel and area monitoring	15
Total		60

Text Book:

1. Fundamental Physics of Radiology (Varghese Publishing House) by Meredith W.J. & Massey J B
2. Christensen's physics of diagnostic radiology, 4th edition

Reference Books:

1. Holmberg O, Malone J, Rehani M, McLean D, Czarwinski R. Current issues and actions in radiation protection of patients.
2. Basic Medical Radiation physics – Stanton, Publisher-McGraw-Hill Inc.,US

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

Level: Semester I

Title of the Paper: Biochemistry	Course: SEC 1
Subject Code: RIT242S101	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 3-0-0-3	Total credits: 3

Objective The scope of the subject is providing biochemical facts and the principles to understand the metabolism of nutrient molecules in physiological and pathological conditions.

Course outcome:

Upon completion of the course student shall be able to:
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CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Know the basic biochemistry of carbohydrates, lipids and proteins	BT 1
CO2	Understand the basics of electrolytes and their importance	BT 2
CO3	Apply the acquired knowledge in the preparation of physical chemistry and organ function tests.	BT 3
CO4	Analyze the various reactions taking place in the human body at the molecular level.	BT 4

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Hours
I.	Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions	15
II.	<ul style="list-style-type: none"> Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines, biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA. 	15
III.	<ul style="list-style-type: none"> Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol. 	15

IV	<p>Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.</p> <ul style="list-style-type: none"> • Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, mechanism of enzyme action, formation of enzyme-substrate complex, factors that affect enzyme activity-pH, temperature, inhibitors 	15
TOTAL		60

Text Book:

1. Nelson, D.L., Cox, M.M. (2017). Lehninger Principles of Biochemistry, 7th Edition; WH Freeman publishers.
2. Robert, K., Murry, Daryl., Granner, K., Victor, W.R. (2015). Harper's Biochemistry, 30th Edition, New Delhi: McGraw-Hill Education / Medical publishers.

Reference Book:

1. Rajagopal, G. & Tura, B.D. (2005). Practical Biochemistry for Medical students. 2nd Edition. Ahuja Publishing House.
2. Harold, Varley. (2005). Practical Biochemistry. 4th Edition. CBS publishers and distributors.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH	-	30 NCH
		Laboratory Visit Home Assignment

		Project work
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Title of the Paper: Introduction to Effective Communication	
Subject Code: CEN982A101	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 1-0-0-1	Total credits: 1

Course Objective: To understand the four major aspects of communication by closely examining the processes and outlining the most effective ways to communicate with interactive activities.

Course Outcomes: On successful completion of the course the students will be able to

CO	Course Outcome	Blooms Taxonomy Level
CO 1	List the elements and processes that make for successful communication and recognise everyday activities that deserve closer attention in order to improve communication skills	BT 1
CO 2	Contrast situations that create barriers to effective communication and relate them to methods that are consciously devised to overcome such hindrance	BT 2
CO 3	Apply language, gestures, and para-language effectively to avoid miscommunication and articulate one's thoughts and build arguments more effectively	BT 3

Detailed Syllabus		
Units	Course Contents	Periods
I	Introduction to Effective Communication <ul style="list-style-type: none"> • Listening Skills <ul style="list-style-type: none"> ○ The Art of Listening ○ Factors that affect Listening ○ Characteristics of Effective Listening ○ Guidelines for improving Listening skills 	5
II	<ul style="list-style-type: none"> • Speaking Skills <ul style="list-style-type: none"> ○ The Art of Speaking ○ Styles of Speaking ○ Guidelines for improving Speaking skills ○ Oral Communication: importance, guidelines, and barriers 	5

III	<ul style="list-style-type: none"> • Reading Skills <ul style="list-style-type: none"> ○ The Art of Reading ○ Styles of Reading: skimming, surveying, scanning ○ Guidelines for developing Reading skills 	5
IV	<ul style="list-style-type: none"> • Writing Skills <ul style="list-style-type: none"> ○ The Art of Writing ○ Purpose and Clarity in Writing ○ Principles of Effective Writing 	5

Textbooks:

1. Rizvi, M. Ashraf. (2017). Effective Technical Communication. McGraw-Hill.
2. Chaturvedi, P. D. and Chaturvedi, Mukesh. (2014). Business Communication. Pearson.
3. Raman, Meenakshi and Sharma, Sangeeta. (2011). Technical Communication: Principles and Practice (2nd Edition): Oxford University Press.

Credit Distribution		
Lecture/Tutorial	Practicum	Experiential Learning
15 hours	-	10 hours <ul style="list-style-type: none"> - Movie/ Documentary /Podcasts screening - Peer teaching

Title of the Paper: Behavioral Science I	
Subject Code: BHS982A104	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 1-0-0-1	Total credits: 1

Course objectives: To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations.

Course Outcomes: On completion of the course the students will be able to :

CO1: Understand self & process of self exploration

CO2: Learn about strategies for development of a healthy self

CO3: Apply the concepts to build emotional competencies.

Detailed Syllabus:

Modules	Course Contents	Periods
I	Introduction to Behavioral Science Definition and need of Behavioral Science, Self: Definition components, Importance of knowing self, Identity Crisis, Gender and Identity, Peer Pressure, Self image: Self Esteem, Johari Window, Erikson's model.	4
II	Foundations of individual behavior Personality- structure, determinants, types of personalities. Perception: Attribution, Errors in perception. Learning- Theories of learning: Classical, Operant and Social	4
III	Behaviour and communication. Defining Communication, types of communication, barriers to communication, ways to overcome barriers to Communication, Importance of Non-Verbal Communication/Kinesics, Understanding Kinesics, Relation between behaviour and communication.	4
IV	Time and Stress Management Time management: Introduction-the 80:20, sense of time management, Secrets of time management, Effective scheduling. Stress management: effects of stress, kinds of stress-sources of stress, Coping Mechanisms. Relation between Time and Stress.	4
Total		16

Text books

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer & Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc

Title of the Paper: IKS-I

Subject Code: IKS992K101

Course Level: 100

Scheme of Evaluation: Theory

L-T-P-C: 2-1-0-3

Total credits: 3

- K.Alex, Soft skills; S.Chand

Course objectives:

This Foundation course is designed to present an overall introduction to all the streams of IKS relevant to the UG program. It would enable students to explore the most fundamental ideas that have shaped Indian Knowledge Traditions over the centuries.

Course Outcomes:

On completion of this course students will be able to :

CO	Contents	BT Level
CO1	Recall the rich heritage of Indian knowledge systems	BT level 1
CO2	Describe the contribution of Indian knowledge systems to the world	BT level 2

CO3	Demonstrate knowledge of sociocultural and ethnolinguistic diversity that constitutes the soul of Bharatvarsha	BT level 3
CO4	Apply traditional knowledge and techniques in day-to-day life	BT level 4

Module	Course Contents	Periods
I	<p>Introduction to Indian Knowledge Systems (IKS): About Indian Knowledge System; Definition of Indigenous/ Traditional Knowledge; Scope, and Importance of Traditional Knowledge.</p> <p>Ancient India- Bharat Varsha: People of Ancient Bharat Varsha; Our great natural heritage: The great Himalayas and the rivers; The civilizations of the Sindhu-Ganga valley, and the Brahmaputra valley; Our coastal plains; Our Nature: Forests and Minerals; Ancient Indian Traditional Knowledge and Wisdom about nature and climate.</p>	15

Module	Course Contents	Periods
II	<p>Indian Heritage of Knowledge: Ancient Indian Knowledge: The Vedas and its components-the Vedangas Ancient Indian books and treaties: The Sastras.; The Great Indian Epics: The Ramayana and The Mahabharata Epics and religious treaties of ancient Assam: Introduction to Madhav Kandali's Ramayan and Srimanta Sankardev's Dasam Skandha Bhagavat of the Puranas; Ancient Traditional Knowledge-The Agamas ; The ancient Buddhist knowledge: Tripitaka: Vinaya, Sutta and Abhidhamma Pitaka</p> <p>Languages and language studies in India: What is linguistics?; Script and Language; Alphabet of the Indian; languages Varnamala: Origin, Evolution, and phonetic features; Languages of India; Important texts of Indian languages: Skills Siksha, Expression/Pronunciation-Nirukta, Grammer-Vyakarana, Poetic rhythm- Chandas;Paninian Grammar: A Brief Introduction</p> <p>Introduction to Fine Arts and Performing Arts of India: Ancient Indian classical music and dance forms: The Science of Dramas- Natyasastra and the Science of Music-Gandharva-Veda;</p>	15

	Aesthetics in Indian Art and Culture; Folk music and traditional dance forms of the Northeast.	
III	<p>Indian Science & Technology: Ancient India's contribution to Mathematics - Number System. Algebra and Arithmetic, Geometry and Trigonometry; Origin of Decimal system in India; nomenclature of numbers in the Vedas. Zero and Infinity. Sulba-sutras. Contribution of Brahmagupta and Sridhar Acharya to Mathematics. Important texts of Indian mathematics.</p> <p>Indian Astronomy: Planetary System. Motion of the Planets; Velocity of Light; Eclipse. Astronomy. Navagrahas. Important works in Indian Astronomy. Aryabhata and Nilakantha: Contribution to Astronomical Studies</p> <p>Indian Metal Works: Mining Techniques. Types of Metals. Tools & Techniques for Metal Smelting with examples. Metalworks in pre- modern India: Special reference to NE India.</p>	15
IV	<p>Contribution of Ancient India to Health Sciences: Traditional Indigenous systems of medicines in India: - Ayurveda and Yoga; Elements of Ayurveda: Gunas and Doshas, Pancha Mahabhuta and Sapta-dhatu; Concept of disease in Ayurveda; Ayurvedic lifestyle practices: Dinacharya and Ritucharya; Important Ayurvedic Texts; Hospitals in Ancient India; Ayurveda: Gift of India to the modern world.</p>	15
Total		60

Textbooks Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. (2022), Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning Private Ltd.
2. Mukul Chandra Bora, Foundations of Bharatiya Knowledge System. Khanna Book Publishing

Reference Books:

1. Baladev Upadhyaya, Samskrta Śāstrom ka Itihās, Chowkhambha, Varanasi, 2010.

2. D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad, 2010.
3. Astāngahrdaya, Vol. I, Sūtrasthāna and Śarīrasthāna, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.
4. Dharampal, The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century, Dharampal Classics Series, Rashtrottana Sahitya, Bengaluru, 2021.
5. J. K. Bajaj and M. D. Srinivas, Indian Economy, and Polity in Eighteenth-century Chengalpattu, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995, pp. 63-84.

The experiential learning sessions may include:

- Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.
- Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.
- Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.
- Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems.
- Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students.

Level: Semester II

Title of the Paper: ANATOMY II	Course: C-103 (Major)
Subject Code: RIT242M201/RIT242M211	Course Level: 100
Scheme of Evaluation: Theory + Practicum	
L-T-P-C: 2-0-2-3	Total credits: 3

Course Objectives

This subject is designed to impart fundamental knowledge on the structure of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of anatomy.

Course Outcomes

On successful completion of the course the students will be able to:		
CO	Course Outcome	Blooms Taxonomy Level
CO 1	Remember the different anatomical structures of the human body.	BT 1
CO2	Compare various body systems and co-relate the anatomy among them all.	BT 2
CO3	Apply different laws in assessing various pathological conditions.	BT 3
CO4	Apply the knowledge of anatomy as necessary in the production of good quality images.	BT 4

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p>Lymphatic System:</p> <ul style="list-style-type: none"> • Lymph & Lymph vessels. • Structure of lymph node, names of regional lymphatics, axillary and inguinal lymph nodes. 	10
II.	<p>Urinary System:</p> <p>Parts of Urinary system, location and gross structure of kidney, ureter, urinary bladder, urethra.</p> <p>Reproductive system:</p> <ul style="list-style-type: none"> • Parts of male reproductive system, gross structure of 	14

	testis, vas deferens, epididymis, prostate. Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland.	
III	<p>Nervous system:</p> <ul style="list-style-type: none"> ● Neuron, classification of NS. ● Meninges, ventricles, CSF. ● Gross features of cerebrum, midbrain, pons, medulla oblongata, cerebellum, name of basal nuclei. ● Blood supply of brain, cranial nerves. ● Spinal cord and spinal nerves. ● Autonomic nervous system. <p>Visual & auditory pathways</p>	10
IV	<p>Endocrine glands:</p> <p>Name of all endocrine glands, gross structure & functions of pituitary gland, adrenal gland, thyroid gland and parathyroid gland.</p> <p>Sensory Organs:</p> <ul style="list-style-type: none"> ● Skin & its appendages. ● Structure of eye & lacrimal apparatus, name of extraocular muscles. <p>Structure of ear: external, middle & inner ear.</p>	10
TOTAL		44

Text Book:

1. Sembulingam, K., Sembulingam, P. (2012). Essentials of Medical Physiology, 6th Edition, New Delhi: Jaypee brothers medical publishers.
2. Wilson, J.W., Livingstone, K. C. (1987). Anatomy and Physiology in Health and Illness, 6th Revised Edition, New York: Churchill Livingstone.

Reference Books:

1. Tandon, O.P., Tripathi, R. (2011). Best and Tailor's Physiological basis of Medical Practice. 13th Edition. USA: Williams & Wilkins
2. Arthur, C. Guyton., Hall, E. J. (2011). Text book of Medical Physiology. 12th Edition. USA: Elsevier's.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
30 NCH	30 NCH	30 NCH Lab visit - Home assignments - Projects

ANATOMY-II PRACTICUM

Total credits: 1

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I	- To identify Femur - To identify Tibia - To identify Fibula - To identify foot	10
II	To identify the pelvic bones	6
III	To identify the bones of the skull	4
IV	To identify the vertebral bones To identify the bones of the rib cage	10
TOTAL		30

Textbooks:

1. Ross and Wilson (2014), Anatomy and physiology in health and illness, 11th edition, Elsevier publications.
2. Chaurasia BD, (2016), Human Anatomy, 7th edition, CBS publisher.

References:

3. Frank. N. Nettar, Atlas of Human Anatomy, 7th Edition, Elsevier
4. Frederic H. Martini, Judi L. Nath, Edwin FB, Fundamentals of Anatomy and Physiology, 9th edition, Pearson publishers.

Level: Semester II

Title of the Paper: PHYSIOLOGY-II	Course: C-104 (Major)
Subject Code: RIT242M202/RIT242M212	Course Level: 100
Scheme of Evaluation: Theory + Practicum	
L-T-P-C: 2-0-2-3	Total credits: 3

Course Objectives: This subject is designed to impart fundamental knowledge on the physiology and the functioning of the various systems of the human body. It also helps in understanding the homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of physiology.

Course outcomes

Course Outline :

On successful completion of the course the students will be able to:		
CO	Course Outcome	Blooms Taxonomy Level
CO 1	Understand the normal physiology of the human body and also the reaction of the body in respect to the surrounding.	BT 1
CO2	To explain the understanding and scope of human physiology in real life situations.	BT 2
CO3	To apply the normal physiological knowledge in assessing abnormal functional findings.	BT 3
CO4	To evaluate how abnormal physiological conditions might affect normal human functioning.	BT 5
MODULE	TOPICS & COURSE CONTENT	PERIODS
I	<p style="text-align: center;">Respiratory System</p> <ul style="list-style-type: none"> • Physiological Anatomy, Functions of the respiratory system. • Types of respiration, respiratory membrane. • Lung volumes and capacities, vital capacity and factors affecting it. • Transport of Oxygen-Forms of transportation, Oxy-hemoglobin dissociation curve and factors 	10

	<p>affecting it.</p> <ul style="list-style-type: none"> • Transport of Carbon-Dioxide- Forms of transportation. • Hypoxia-Definition, types, effects of hypoxia. • Cyanosis-Definition and types. • Artificial Respiration- CPR 	
<p>II.</p>	<p>Excretory System</p> <ul style="list-style-type: none"> ○ Kidneys-structure of nephron, functions of kidney ○ Glomerular filtration Rate(GFR) and factors affecting it ○ Counter Current Mechanism <ul style="list-style-type: none"> ▪ Bladder-its innervation, micturition reflex <p>Reproductive System</p> <ul style="list-style-type: none"> ○ Male Reproductive System-Stages of spermatogenesis, function of Testosterone <ul style="list-style-type: none"> ▪ Female Reproductive System-Ovulation, menstrual cycle, functions of Estrogen and progesterone 	<p>14</p>

III	<p style="text-align: center;">Central Nervous System</p> <ul style="list-style-type: none"> ○ Structure of neuron, functions of nervous system. ○ Classification and properties of nerve fibres ○ Synapse- structure and types ○ Receptors-Definition, classification, properties, Reflex Arc ○ Functions of Hypothalamus ○ Functions of Cerebellum and Basal Ganglia ○ Functions of Cerebral Cortex ○ Autonomic Nervous System- Actions of sympathetic and parasympathetic system and their comparison. ○ Special Senses-Eye-structure, functions of different parts, Visual acuity, Refractive errors ○ Ear-structure, functions, General mechanics of hearing. 	10
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IV	<p style="text-align: center;">Endocrine System</p> <ul style="list-style-type: none"> ○ Classification of Endocrine glands and their hormones. ○ Thyroid Gland-Physiological Anatomy, hormones secreted, functions, disorders- Hypo and hyper secretion of hormone. ○ Adrenal Gland-Adrenal Cortex-Physiological Anatomy, its hormones and functions. ○ Adrenal Medulla-Hormones, functions. ○ Pituitary Gland- Anterior and posterior pituitary hormones and their functions,disorders. ○ Pancreas- Hormones and their functions, Diabetes Mellitus-types, pathophysiology, signs and symptoms. ● Parathyroid Gland- Hormones and their functions. 	10
TOTAL		44

Text Book:

1. Sembulingam, K., Sembulingam, P. (2012). Essentials of Medical Physiology, 6th Edition, New Delhi: Jaypee brothers medical publishers.
2. Wilson, J.W., Livingstone, K. C. (1987). Anatomy and Physiology in Health and Illness, 6th Revised Edition, New York: Churchill Livingstone.

Reference Books:

1. Tandon, O.P., Tripathi, R. (2011). Best and Tailor’s Physiological basis of Medical Practice. 13th Edition. USA: Williams & Wilkins
2. Arthur, C. Guyton., Hall, E. J. (2011). Text book of Medical Physiology. 12th Edition. USA: Elsevier’s.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING

30 NCH	30 NCH	30 NCH Lab visit - Home assignments - Projects
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PHYSIOLOGY-II PRACTICUM

Credit: 1

DETAILED SYLLABUS

MODULE	TOPICS & COURSE CONTENT	PERIODS
I	1. Qualitative test for ABO Grouping	4
II	1. Determination of Platelet count	6
III	Determination of Erythrocyte Sedimentation Rate	10
IV	1. Determination of Haematocrit	10
	TOTAL	30

Text Books:

1. Guyton and Hall ,2011, Textbook of medical physiology ,12th edition, Elsevier publications
2. Sembulingam K (2012) , Essentials of Medical physiology, 6th edition, Jaypee Publications.

References:

1. Frederic H. Martini, Judi L.Nath, EdwinFB, Fundamentals of Anatomy and Physiology,9th edition, pearson publishers
2. Elaine N.Mareib,Essential of Human Anatomy and physiology, 10th edition, Pearson publishers.

3. Ross and Wilson (2014), Anatomy and physiology in health and illness, 11th edition, Elsevier publications

Level: Semester II

Title of the Paper: Basics of Anatomy & Physiology	Course: M-102 (MINOR)
Subject Code: RIT242N201	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 3-0-0-3	Total credits: 3

Objective: This syllabus has been formulated to impart basic knowledge on principles of radiation physics and modern physics in radiology.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the different anatomical structures of the human body.	BT 1
CO2	Compare various body systems and co-relate the anatomy among them all.	BT 2
CO3	Apply different laws in assessing various pathological conditions.	BT 3
CO4	Apply the knowledge of anatomy as necessary in the production of good quality images.	BT4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> ● Introduction: ● Definition of anatomy and its divisions, Terms of location, positions and planes. ● Cell and its organelles, Tissues & its classification, Glands. ● Gastro-intestinal System: ● GIT anatomy & physiological function ● Parts of the GIT - mouth, pharynx, oesophagus, stomach ● Abdominal cavity - divisions and regions ● Liver ● Pancreas ● Spleen ● Gall Bladder ● Intestine (small and large) - 	15
II.	<p>Respiratory system and their anatomy & physiological function</p> <ul style="list-style-type: none"> ● Parts of Respiratory system; Structure of nose, nasal cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments. <p>Cardiovascular System:</p> <p>Anatomy & physiological function of cardiovascular systems</p> <ul style="list-style-type: none"> ○ Arteries & veins, Capillaries & arterioles. ○ Heart- size, location, chambers, 	15

	<p>blood supply of heart, pericardium.</p> <ul style="list-style-type: none"> ○ Systemic & pulmonary circulation. ○ Major blood vessels of Heart <p>-</p>	
III	<p>Musculoskeletal & Nervous system:</p> <ul style="list-style-type: none"> • Structure of Bone & its types. • Joints- Classification of joints with examples; details of synovial joint. • Axial skeleton & appendicular skeleton • Bones of appendicular skeleton • Bones of axial skeleton • Locomotor system - bone , cartilage, ligaments and tendons • Muscles & its types <p>Nervous system:</p> <ul style="list-style-type: none"> • Neuron, classification of NS. • Meninges, ventricles, CSF. • Gross features of cerebrum, midbrain, pons, medulla oblongata, cerebellum, name of basal nuclei. • Blood supply of brain, cranial nerves. • Spinal cord and spinal nerves. • Autonomic nervous system. • Visual & auditory pathways <p>-</p>	15
IV	<p>Urinary & Reproductive system:</p> <p>Parts of Urinary system, location and gross structure of kidney, ureter, urinary bladder, urethra.</p> <ul style="list-style-type: none"> • Parts of male reproductive system, gross 	15

	<p>structure of testis, vas deferens, epididymis, prostate.</p> <p>Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland.</p> <p style="text-align: center;">-</p>	
TOTAL		60

Text Book:

1. Chaurasia BD, (2016), Human Anatomy, 7th edition, CBS publisher.
2. Sembulingam. K, Human Physiology- Vol. 1&2 ,Medical Allied, 7th Edition.

Reference Books:

1. Frank. N. Netter, Atlas of Human Anatomy, 7th Edition, Elsevier
2. Ross and Wilson (2014), Anatomy and physiology in health and illness, 11th edition, Elsevier publications

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH	-	30 NCH
		Laboratory Visit Home Assignment Project work

Level: Semester II

Title of the Paper: Hospital Duty & Patient Care	Course: SEC2
Subject Code: RIT242S201	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 3-0-0-3	Total credits: 3

COURSE OBJECTIVE:

This syllabus has been formulated to impart basics knowledge on hospitals, record keeping and report writing, basic care, comfort, sign and symptoms and hygiene of patients.

COURSE OUTCOME

On successful completion of the course the students will be able to:		
CO	Course Outcome	Blooms Taxonomy Level
CO 1	Recall the principles and functions of hospital management.	BT 1
CO2	Explain and demonstrate the concept of writing good reports and records.	BT 2
CO3	Apply the knowledge about quality management and disposal of bio medical waste.	BT 3
CO4	Apply the concept of basic care needs and maintaining personal and hospital hygiene to real life hospital situations.	BT 4

COURSE OUTLINE:

MODULE	TOPICS & COURSE CONTENT	PERIODS
I.	<ul style="list-style-type: none"> • Hospitals - types and administration • Structural organisation of the Radiology department • Records and reports • Hospital Management and Human Resource • Ethical codes 	10
II.	<ul style="list-style-type: none"> • Quality Management • Biomedical waste management • Basic care needs Laboratory safety 	6

III.	<ul style="list-style-type: none"> • Vital signs 	10
IV	<ul style="list-style-type: none"> • Communication • Care of patient • Patient rights and responsibilities • Negligence • Comfort positions for patient 	10
	TOTAL	36

Textbooks:

1. Hospital Duty and Patient Care in Diagnostic Radiology – Dr. N. K. Karda, , Lalit Agarwal, J.B.D. Publication.
2. Patients Right – A Sampath Kumar (CBS Publication.

References:

1. Fundamentals of Hospital Practice and Patient care – Vyakarnam Nageswar, Paras medical books Pvt. Ltd.
2. Principles of Hospitals Practice and Patient Care – P Srinivasulu Reddy , Paras medical books Pvt. Ltd.
3. Hospital Supporting Services and System – Dr. M A George , Daya Publishing House.
4. Manual of First Aid – L. C. Gupta, Abhitabh Gupta , Jaypee Publication.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH	-	30 NCH
		Hospital Visit Home Assignment Project work

Title of the Paper: Communicative English II

Course: AEC2

Subject Code: CEN982A201	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 1-0-0-1	Total credits: 1

Course Objectives

To introduce the students to the various forms of technical communication and enhance their knowledge in the application of both verbal and non-verbal skills in communicative processes. **Course Outcomes**

On successful completion of the course the students will be able to:		
SI No	Course Outcome	Blooms Taxonomy Level
CO 1	Identify the different types of technical communication, their characteristics, their advantages and disadvantages.	BT 1
CO 2	Explain the barriers to communication and ways to overcome them.	BT 2
CO 3	Discover the means to enhance conversation skills.	BT 3
CO 4	Determine the different types of non-verbal communication and their significance.	BT4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I	Technology Enabled Communication Communicating about technical or specialized topics, Different forms of technology-enabled communication tools used in organisations Telephone, Teleconferencing, Fax, Email, Instant messaging , Blog, podcast, Videos, videoconferencing, social media	4
II	Communication Barriers Types of barriers: Semantic, Psychological, Organisational, Cultural, Physical, and Physiological. Methods to overcome barriers to communication.	4
III	Conversation skills/Verbal Communication Conversation – Types of Conversation, Strategies for Effectiveness, Conversation Practice, Persuasive Functions in Conversation, Telephonic Conversation and Etiquette Dialogue Writing, Conversation Control.	4

IV	Non-verbal Communication Introduction; Body language- Personal Appearance, Postures, Gestures, Eye Contact, Facial expressions Paralinguistic Features- Rate, Pause, Volume, Pitch/Intonation/ Voice/ modulation Proxemics , Haptics, Artifacts, Chronemics	4
	Total	16

Texts:

1. Rizvi, M. Ashraf. (2017). Effective Technical Communication. McGraw-Hill.

2. Chaturvedi, P. D. and Chaturvedi, Mukesh. (2014). Business Communication. Pearson.
3. Raman, Meenakshi and Sharma, Sangeeta. (2011). Technical Communication: Principles and Practice (2nd Edition): Oxford University Press.

References:

1. Hair, Dan O., Rubenstein, Hannah and Stewart, Rob. (2015). A Pocket Guide to Public Speaking. (5th edition). St. Martin's. ISBN-13:978-1457670404
2. Koneru, Aruna.(2017) Professional Communication. New Delhi: Tata McGraw Hill ISBN-13: 978-0070660021
3. Raman, Meenakshi and Singh, Prakash.(2012). Business Communication (2nd Edition): Oxford University Press
4. Sengupta, Sailesh.(2011) Business and Managerial Communication. New Delhi : PHI Learning Pvt. Ltd.

Title of the Paper: Behavioral Science II	Course: SEC2
Subject Code: BHS982A204	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 1-0-0-1	Total credits: 1

Course objectives: To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations.

Course outcomes: On completion of the course the students will be able to:

CO 1: Develop an elementary level of understanding of culture and its implications on personality of people.

CO2: Understand the concept of leadership spirit and to know its impact on performance of employees.

CO3: Understand and apply the concept of Motivation in real life.

Modules	Course Contents	Periods
I	Culture and Personality Culture: Definition, Effect, relation with Personality, Cultural Iceberg, Overview of Hofstede's Framework, Discussion of the four dimensions of Hofstede's Framework.	4

II	Attitudes and Values Attitude's definition: changing our own attitudes, Process of cognitive dissonance Types of Values, Value conflicts, Merging personal and Organisational values	4
III	Motivation Definition of motivation with example, Theories of Motivation (Maslow, McClelland's theory & Theory X and Y)	4
IV	Leadership Definition of leadership, Leadership continuum, types of leadership, Importance of Leadership, New age leaderships: Transformational & transactional Leadership, Leaders as role models.	4
Total		16

Text books:

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer & Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

Title of the Paper: Introduction to Indian Knowledge System - II	
Subject Code: IKS992K201	Course Level: 100
Scheme of Evaluation: Theory	
L-T-P-C: 2-1-0-3	Total credits: 3

Course objectives:

This Foundation course is designed to present an overall introduction to all the streams of IKS relevant to the UG program. It would enable students to explore the most fundamental ideas that have shaped Indian Knowledge Traditions over the centuries.

Course Outcomes:

On completion of this course, students will be expected to –

CO	Contents	BT Level
CO1	Recall traditional Indian knowledge traditions constituting Indian culture	BT level 1
CO2	Summarize differences between classical literature in Sanskrit and other Indian languages	BT level 2
CO3	Compare knowledge traditions originating in NE India	BT level 2
CO4	Appreciate the contribution of Indian Knowledge Systems to the world	BT level 3

Module	Course Contents	Periods
I	<p>Indian Classical Literature Indian Classical Literature: A Brief Introduction; Ancient Indian Spritual Poetics-Kavya: Contribution of Kalidasa</p> <p>Diversity and Indian Culture: Diversity and Indian Culture; Indigenous Faith and Religion; Preservation of culture and indigenous knowledge</p> <p>The Purpose of Knowledge: Understanding Self-Awareness and Spirituality; Indian concept and purpose of Knowledge and Education; Understanding Spirituality and Materialism: Para and Aparā Vidya</p>	15

Module	Course Contents	Periods
II	<p>Methodology of Indian Knowledge System: Shruti and Smriti traditions; Intoduction to Shastras; Manuscriptology: The art and science of documenting knowledge; Repositories of ancient manuscripts with special reference to the Northeast India.</p> <p>Indian Architecture and Town Planning: Introduction ancient Indian architecture; Sthapatya-Veda: An Introduction; Indigenous tools & techniques for town planning & Temple Architecture. Lothal, Mohan Jo Daro; Temple Art: Lepakshi Temple, Jagannath Puri Temple, Konark Sun Temple; Vernacular</p>	15

	architecture of Assam: Special reference to Brahmaputra Valley	
III	<p>Indian Agriculture: Agriculture: Significance in Human Civilization; Sustainable Agriculture; Historical significance of agriculture and sustainable farming in India; Step Cultivation of India: Special reference to Northeast India; Wet rice cultivation of Assam.</p> <p>Indian Textiles: What is Textile?; Tradition of cotton and silk textiles in India; The historical contribution of textile and weaving to the Indian economy; Varieties of textiles and dyes developed in different regions of India with special reference to Northeast India</p>	15
IV	<p>Indian Polity and Economy: Understanding Kingdom and Chiefdom; Role of a king; The Indian idea of a well-organized polity and flourishing economy; The Chakravarti System: Administrative System of Ancient Bharatvarsha; Village administrative system: Northeast India; Arthashastra: Brief synopsis</p> <p>The outreach of Indian Knowledge System across Geographical Boundaries: Indian Languages; Scripts; Linguistics; Ayurveda; Yoga and Meditation; Textile; Decimal value place system-based arithmetic, Algebra and Astronomy</p>	15
Total		60

Textbooks Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. (2022), Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning Private Ltd.
2. Mukul Chandra Bora, Foundations of Bharatiya Knowledge System. Khanna Book Publishing

Reference Books:

1. Baladev Upadhyaya, Samskrta Śāstrom ka Itihās, Chowkhambha, Varanasi, 2010.

2. D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad.

The experiential learning sessions may include:

- Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.
- Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.
- Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.
- Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems.
- Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students.

Level: Semester III

Title of the Paper: Basic Physics	Course: Major
Subject Code: RIT242M301/RIT242M311	Course Level: 200
Scheme of Evaluation: Theory + Practical	
L-T-P-C: 2-0-4-4	Total Credits: 4

Objective: This subject is designed to impart fundamental knowledge on the structure of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of anatomy.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	Bloom's Taxonomy Level
CO 1	Remember the different electrical equipments and the functions of each.	BT 1
CO2	Demonstrate the electrical connections of different electrical appliances.	BT 2
CO3	Apply the theoretical knowledge practically to check loose wires and correct faulty connections.	BT 3
CO4	Create different electrical circuits using different electrical and electronic appliances.	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
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I.	<p>Fundamental of Electricity:</p> <ul style="list-style-type: none"> ● Electric Charges & Units of Electric Charge. Coulombs Law, Electric Induction, Electric Potential & Potential Difference, Capacitance & Capacitors, Resistance. ● Conductors, Insulators & Semiconductors, Electric Current, Ohm's Law & Kirchhoff Law, Circuit Laws (Combination of Potential Difference In Series & Parallel, Meters, Electrical Energy & Power, Heating Effect of A current. ● The Magnetic Effects of An Electric Current (Electromagnetism), Electromagnetic Induction, Mutual Induction & self Induction. ● Alternating Current, The A.C. Transformer theory, construction, types of transformers its practical aspects, transformer losses and regulation & rating, types of transformers used in x-ray equipment. ● Transistors and its types ● Meaning of rectification (full wave & half wave rectification). Principles of semiconductors, p-n junction diode, high voltage rectifier circuits (self rectifying circuit, half-wave pulsating voltage circuit, full-wave pulsating voltage circuits 	8
II.	<p>X-rays :</p> <p>Conductivity of electricity through gases at low pressure, cathode rays-production & properties. Sources of electrons (discharge through gases, thermionic emission & photo electric emission), discovery of an electron, concept of electron volt.</p>	4

III	<p style="text-align: center;">Mains Supply :</p> <p>Generation of electrical energy, distribution of electrical energy, use of electrical energy, polyphase supplies, availability of different voltages, feeder cables, line voltage drop; mains switches, fuses, circuit breakers. earthing, insulation, high tension cables construction, design.</p>	4
IV	<p style="text-align: center;">Diagnostic High Tension Circuits :</p> <p>Capacitor discharge, constant potential. main voltage compensation, mains resistance compensation, compensations for mains frequency variation. . High tension (tube selector) switch. meters- function; use of shunts. Meters Commonly Found In Diagnostic X-Ray Equipment, Position In Circuits, Reading Meters.</p>	8
TOTAL		24

Textbook:

1. Basic Medical Radiation physics – K Thalayan, Jaypee Brothers Medical Publishers Ltd.

Reference Books:

1. Christensen’s Physics of Diagnostic Radiology – Christensen publisher-Wolters Kluwer India Pvt. Ltd.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH	30 NCH	30 NCH - Lab visit

		<ul style="list-style-type: none"> - Home assignments - Projects
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PRACTICAL:

Modules	Topics	Periods
I	<p>Basic electricity -----</p> <p>i) To determine the resistance per cm of a given wire by plotting a graph for potential difference versus current</p> <p>ii) Determination of equivalent resistance of two resistors when connected in series and parallel.</p> <p>iii) Study the dependence of potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. Also plot a graph between V & I.</p> <p>iv) To study steps of constructing a simple electrical circuit</p> <p>v) Identification of electrical equipments</p> <p>vi) To verify Kirchoff's current and voltage laws.</p> <p>vii) To determine the transformer ratio of a given transformer</p> <p>Viii) To study the behavior of half wave rectifier and full wave rectifier.</p> <p>ix) To plot the graph of forward and reverse bias characteristics of a SI-junction diode.</p>	10
II	<p>Basic Electronics -----</p> <p>i) To study the variation of current with voltage across a conductor and hence verify Ohm's law.</p> <p>ii) To determine the resistance of a galvanometer by half-deflection method.</p> <p>iii) To study the effect of voltmeter resistance on voltage measurement.</p> <p>iv) To determine the internal resistance of a cell using potentiometer.</p> <p>v) To find the resistance of a give wire resistor using a meterbridge</p>	8

III	Introduction to different electrical appliances	4
IV	Magnetism ----- i) To determine the strength of magnetic field using Faraday's law of Electromagnetic induction	8
	Total	30

Level: Semester III

Title of the Paper: General Radiographic Technique	Course: Major
Subject Code: RIT242M312	Course Level: 200
Scheme of Evaluation: Practical	
L-T-P-C: 0-0-8-4	Total Credits: 4

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	Bloom's Taxonomy Level
CO 1	Remember the routine and special projections for all the different parts of the human body	BT 1
CO2	Explain different radiographic projections taken for different body parts	BT 2
CO3	Apply the knowledge of anatomy in producing accurate radiographs	BT 3
CO4	Create good quality accurate radiographs by using multiple projection knowledge for particular body part	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> ● Upper-limb: ● Routine projections for the whole Hand, Fingers, Wrist Joint, Forearm, Elbow Joint and Humerus. Supplementary projections for scaphoid, carpal tunnel ball catchers projections, head of the Radius, Supracondylar Fracture and Olecranon Process. ● Lower limb: ● Routine Projections For The Whole Foot, Toes, Calcaneum, Ankle Joint, Leg, Knee-Joint, Patella and Femurs. Supplementary Projections For Talo-Calcaneal Joint, Forced Projections For Torn Ligaments, Flat Feet, Club Feet, Intercondylar Projections For Loose Bodies In The Knee, Axial Projection For Patella. 	12
II.	<ul style="list-style-type: none"> ● Pectoral Girdle and Thorax: ● Routine Projections For Shoulder Joint, Scapula, Acromio-Clavicular Joint, Clavicle, Sternoclavicular Joint, Sternum and Ribs. ● Supplementary Projections For The Axial Projections of Clavicle, Bicipital Groove Carotid Process, Classification of Tendons, Subluxation, Upper Ribs and Axillary Ribs. ● Pelvic Girdle and Hip Region: ● Routine Projections For The Whole Pelvis, Sacro-Ileac Joints, Hip Joint and Neck of Femur. ● Supplementary Projections For The Greater and Lesser Trochanters of Femur. Frog Leg Projection, Ischeum Symphysis Pubis, Ileum, Accetabulum and Congenital Dislocation of Hip Arthrodesis. 	12

III	<ul style="list-style-type: none"> ● Abdomen: ● Kub, Erect Abdomen and Decubitus Projection, Supplementary Projections For Acute Abdomen. ● Chest: ● Routine Projections For Lungs, Cardia and Diaphragm. ● Supplementary Projections For Opaque Swallow, Thoracic Inlet, Soft Tissue Neck, Decubitus, Apicograms, Paediatric Cases. 	8
IV	<ul style="list-style-type: none"> ● Skull: ● Routine Projections For Cranium and Facial Bones. ● Supplementary Projections For Trauma, Towne's & Method, Sella, Turcica, Optic Foramina, Jugular Foramina, Temporal Bones, Mastoids Petrous Bone, Zygomatic Arches, Orbits, Maxillae, Nasal Bones, Mandible, Temporomandibular Joints. ● Nasal Sinuses: ● Techniques For Frontal, Maxillary, Ethmoidal and Sphenoid Sinuses, Erect and Horizontal Projections For Fluid Levels. ● Teeth: ● Routine Projections of All Teeth- Intra Oral and Extra Oral Projections. ● Supplementary Projections For Localisation of Roots, Children, Edentulous Subjects and Use of Occlusals and Bitewings, Orthopantomography. ● Vertebral Column: ● Routine Projections For The Greater Occipital Joint, Cervical Spine, Cervico Thoracic Junction, Thoracic 	16

	<p>Spine, Lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx.</p> <ul style="list-style-type: none"> • Supplementary Projections For The Intervertebral Foramina, Posterior Arch of Atlas, Flexion and Extension of Cervical Spine, Scoliosis, and Kyphosis, Sacro Illeac Joint. • CR and DR : • Application of CR, its instrumentations, DRY and Laser printer, CR Printer's application. • PACS, DICOM, Application, Functions, Features and its advantages. • Automatic processor, Application, principal. Working technique, work load handling in automatic processor. • Radiological Information Systems 	
TOTAL		48

Text Book:

1. Textbook Of radiology For Residents & Technicians, Bhargava S. K

Reference Books:

1. Radiologic Science for Technologists: Physics, Biology, and Protection, Stewart C. Bushong
2. Pocketbook of Radiographic Positioning, Third edition, Ruth Sutherland, Calum Thompson.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	90 NCH	30 NCH
		<p>Hospital visit</p> <ul style="list-style-type: none"> - Case Study - Projects

Level: Semester III

Subject Name: Darkroom Technique	Subject Code: RIT242M303
L-T-P-C – 4-0-0-4	Credit Units: 4
	Scheme of Evaluation: T

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	Bloom's Taxonomy Level
CO 1	Remember the routine and special projections for all the different parts of the human body	BT 1
CO2	Explain different radiographic projections taken for different body parts	BT 2
CO3	Apply the knowledge of anatomy in producing accurate radiographs	BT 3
CO4	Create good quality accurate radiographs by using multiple projection knowledge for particular body part	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p align="center">Dark Room Planning:</p> <ul style="list-style-type: none"> • For a Small Hospital, For a Large Hospital • Location of Dark Room • Construction of Dark Room 	8

	<ul style="list-style-type: none"> • Ventilation • Wall Protection • Darkroom entrance 	
II.	<p>Dark Room:</p> <ul style="list-style-type: none"> • Instruction To Staff • Dry Bench • Hopper, Drawer, Cupboard • Loading and Unloading Cassettes • Hangers, Types of Hangers and Storage of Hangers • Printing • Wet Bench • Cleanliness, Control of Dust, Dark Room Sink • Hatches • Drier • Safe Lights, Direct and Indirect, Uses, Factors Affecting Safelight Performance, Safelight Tests 	8
III	<p>X-Ray Films :</p> <ul style="list-style-type: none"> • Glass, Cellulose and Ployester Bases • Structure of X-Ray Films- Emulsion, Gelatin, Base and Supercoating • Types of X-Ray Films • Single Coated, Duplited 	16

	<ul style="list-style-type: none"> • Spectral Sensitivity • Colour Sensitivity • Graininess of Films • Speed of Films • Screen & Non Screen Films • Various Formats of Films • Films For Special Procedures <p>Processing Methods:</p> <ul style="list-style-type: none"> • Preparation of Solution • Manual Processing Apparatus • Control of Temperature • Rapid Processing • Automatic Processor- Principle and Features, Water Supply, Use of Thermostat, Regeneration of Solutions, Maintenance. Advantage and Limitations, Processing of Cut Films and Roll Films. <p>Developer:</p> <ul style="list-style-type: none"> • Constituents • Characteristics • Manual and Automatic Processors • Effects on Developing Time, Temperature, Agitation • Replenisher 	
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- Exhaustion

Rinsing :

- Acid Stop-Bath
- Methods
- Objects

Fixer :

- Constituents
- Characteristics
- Manual and Automatic Processors
- Fixing Time and Clearing Time
- Factors Affecting Fixing Time
- Replenisher1
- Exhaustion

Washing and Drying:

- Objects
- Methods
- Factors Affecting Washing and Drying
- Wetting Agents

	<ul style="list-style-type: none"> • Comparison of Different Methods <p>Day Light Film Handling:</p> <ul style="list-style-type: none"> • Day Light System Using Cassettes • Day Light System without Cassette 	
IV	<p>X-Ray Cassette:</p> <ul style="list-style-type: none"> • Construction of X-Ray Cassettes • Types of Cassettes • Mounting Intensifying Screens In Cassettes • Identification of Cassettes • Care of Cassettes <p>Intensifying Screens:</p> <ul style="list-style-type: none"> • Fluorescence-Phosphors • Phosphors Employed <ul style="list-style-type: none"> – Calcium Tungstate – Barium Fluochloride – Rare Earths • Construction of Intensifying Screens • The Influence of Kilovoltage In Different Phosphors • Intensification Factor • Resolving Power of Intensifying Screens • Speed of Screens 	16

	<ul style="list-style-type: none"> • Screen Film Contact Tests • Types of Intensifying Screens <p style="text-align: center;">Advantages and Limitations of Intensifying Screens</p>	
TOTAL		48

Text Book:

2. Textbook Of radiology For Residents & Technicians, Bhargava S. K

Reference Books:

3. Radiologic Science for Technologists: Physics, Biology, and Protection, Stewart C. Bushong
4. Pocketbook of Radiographic Positioning, Third edition, Ruth Sutherland, Calum Thompson.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	90 NCH	30 NCH
		Hospital visit - Case Study - Projects

Level: Semester III

Title of the Paper: Computer Skills	Course: SEC
Subject Code: RIT242S313	Course Level: 200
Scheme of Evaluation: Practical	
L-T-P-C: 0-0-6-3	Total Credits: 3

purposes of preparing his personnel/business letters, viewing information on Internet, sending mails, using internet banking services etc. This allows a common man or housewife to be also a part of computer users list by making them digitally literate. This would also aid the PC penetration program. This helps the small business communities, housewives to maintain their small account using the computers and enjoy in the world of Information Technology

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	Bloom's Taxonomy Level
CO 1	Define the various parts of a computer, the basics of computer architecture and learn about the various components of computer architecture.	BT 1
CO2	Learn the different operating systems and learn their uses while handling the various softwares that comes along with the machines.	BT 2
CO3	Apply the knowledge of MS word, excel and powerpoint in creating projects and presentations	BT 3
CO4	Apply the knowledge of computer skills in producing, editing and formating various images of the different modalities of the Radiology department in turn producing good quality images.	BT 4

Detailed Syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I	<p>Computer Applications & Basics: Introduction, Basic Applications of Computer, Components of Computer, Connecting Computer Components, Computer Hardware & Software</p> <p>Introduction to Internet, WWW & Web Browsers: Basics of Computer Networks, Internet, Search Engines, URLs, How to use Web Browser</p>	14

II.	Computer Operating System: Basics of Operating System, Linux, Windows, Task Icons, Bars, System Settings, Setting Date & Time, File Management	10
III	Word Processing: Introduction, Printing a File, Document Creation & Editing, Saving, Text Formatting Microsoft Excel & using Spreadsheets: Introduction, Rows, Columns & Cells, Basics Excel Formulas and Functions	12
IV	Communications & Collaboration: Basics of Email, How to use Email, Instant Messaging, Format an Email Making Small Presentation: How to Create, Edit, Format, or Delete Slides, Make a Slideshow, Save a Presentation, Printing of Presentation	12
TOTAL		48

Text Book:

1. Computer Fundamentals: Concepts, Systems & Applications Sinha, P. K/ Sinha, P. 3rd ed BPB
2. "Fundamentals of Computers" by V. Rajaraman, 6th Edition, PHI Learning.

Reference Books:

1. Objective Computer Awareness, Arihant Experts
2. Computer fundamentals : Concepts, Systems and Applications , Priti Sinha, Pradeep K Sinha

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	60 NCH	30 NCH Lab visit Home assignments Projects

Level: Semester III

Course Objective: The aim of the course is to develop essential business communication skills, including effective writing, speaking, and interpersonal communication, to enhance professional interactions, collaboration, and successful communication strategies within diverse corporate environments.

Course Outcomes: On successful completion of the course the students will be able to:

Title of the Paper: CEN-III- Fundamentals of Business Communication	Course: AEC
Subject Code: CEN982A301	Course Level: 200
Scheme of Evaluation: Theory and Practical	
L-T-P-C: 1-0-0-1	Total Credits: 1

CO	Course Outcome	Blooms Taxonomy Level
CO 1	Define and list business documents using appropriate formats and styles, demonstrating proficiency in written communication for various business contexts.	BT 1
CO 2	Demonstrate confident verbal communication skills through persuasive presentations, active listening, and clear articulation to engage and influence diverse stakeholders.	BT 2
CO 3	Apply effective interpersonal communication strategies, including conflict resolution and active teamwork, to foster positive relationships and contribute to successful organizational communication dynamics	BT 3

Detailed Syllabus		
Units	Course Contents	Periods

I	<p>Business Communication: Spoken and Written</p> <ul style="list-style-type: none"> • The Role of Business Communication • Classification and Purpose of Business Communication • The Importance of Communication in Management • Communication Training for Managers • Communication Structures in Organizations • Information to be Communicated at the Workplace • Writing Business Letters, Notice, Agenda and Minutes 	5
II	<p>Negotiation Skills in Business Communication</p> <ul style="list-style-type: none"> • The Nature and Need for Negotiation <ul style="list-style-type: none"> ○ Situations requiring and not requiring negotiations • Factors Affecting Negotiation <ul style="list-style-type: none"> ○ Location, Timing, Subjective Factors • Stages in the Negotiation Process <ul style="list-style-type: none"> ○ Preparation, Negotiation, Implementation • Negotiation Strategies 	5
III	<p>Ethics in Business Communication</p> <ul style="list-style-type: none"> • Ethical Communication • Values, Ethics and Communication • Ethical Dilemmas Facing Managers • A Strategic Approach to Business Ethics • Ethical Communication on Internet • Ethics in Advertising 	5
IV	<p>Business Etiquettes and Professionalism</p> <ul style="list-style-type: none"> • Introduction to Business Etiquette • Interview Etiquette • Social Etiquette • Workplace Etiquette • Netiquette 	5

Textbook:

1. Business Communication by Shalini Verma
2. "Business Communication" by Meenakshi Raman and Prakash Singh, published by

Title of the Paper: Behavioural Sciences -III	Course: AEC
Subject Code: BHS982A304	Course Level: 200
Scheme of Evaluation: Theory and Practical	
L-T-P-C: 1-0-0-1	Total Credits: 1

Oxford University Press.

References:

1. Business Communication by PD Chaturvedi and Mukesh Chaturvedi
2. Technical Communication by Meenakshi Raman and Sangeeta Sharma

Credit Distribution		
Lecture/Tutorial	Practicum	Experiential Learning
15 hours	-	10 hours - Group Discussion - Presentation - Quiz - Case Study

Level: Semester III

Course objectives: To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations .To enable the students to understand the process of problem solving and creative thinking.

Course outcomes: On completion of the course the students will be able to:

CO	Course Outcome	Blooms Taxonomy Level
CO 1	Understand the process of problem solving and creative thinking.	BT 1
CO 2	Develop and enhance of skills required for decision-making.	BT 2

Modules	Course Contents	Periods
I	Problem Solving Process Defining problem, the process of problem solving, Barriers to problem solving(Perception, Expression, Emotions, Intellect ,surrounding environment)	4
II	Thinking as a tool for Problem Solving What is thinking: The Mind/Brain/Behaviour Critical Thinking and Learning: -Making Predictions and Reasoning. -Memory and Critical Thinking. - Emotions and Critical Thinking.	4
III	Creative Thinking - Definition and meaning of creativity, - The nature of creative thinking :Convergent and Divergent thinking, - Idea generation and evaluation (Brain Storming) - Image generation and evaluation. - The six-phase model of Creative Thinking: ICEDIP model	4

IV	Building Emotional Competence Emotional Intelligence – Meaning, components, Importance and Relevance Positive and Negative emotions Healthy and Unhealthy expression of emotions	4
Total		16

Text books:

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer & Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

Semester IV

Title of the Paper: Physics of Radiology	Course: Major
Subject Code: RIT242M401	Course Level: 200
Scheme of Evaluation: Theory	
L-T-P-C: 3-1-0-4	Total Credits: 4

Objective: This syllabus has been formulated to impart basics knowledge on principles of radiation physics and modern physics in radiology.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the key concepts of physics	BT 1

CO2	Demonstrate the structure and functions of a modern day x-ray tube	BT 2
CO3	Apply various principles of physics in the generation high and low frequency x-rays as per need	BT 3
CO4	Analyze various equipments to identify faulty systems and fix them as per need	BT4

Detailed Syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> ● Structure of atom , Bohr's atomic model ● Electromagnetic waves and their properties ● Electromagnetic spectrum and Spectrum of white light ● History of X-rays ● Production of x-ray & its properties ● Physics of X-ray spectra - characteristics and brehmstrahlung x-rays ● Factors upon which x-ray emission depends, soft and hard x-rays ● Interaction of x-ray with matter ● Coherent scattering- Thomson scattering, Rayleigh Scattering, Photoelectric absorption, pair production, photo disintegration ● Attenuation 	14
II.	<ul style="list-style-type: none"> ● X-Ray Tubes ● Construction of various x-ray tube & handling ● Cathode and Filament design ● cathode 	14

	<ul style="list-style-type: none"> ● Fixed and rotating anode, faults in X-Ray tubes, Grid Controlled X-Ray Tube, ● Mammography X-Ray Tube. ● Heavy Duty X-Ray Tube, Micro-Focus X-Ray Tube ● Tube heat Ratings and methods of heat dissipation ● Line Focus principle, Anode Cooling chart ● Tube overload indication, X-Ray Tube over Load Protection Circuits ● Grid ● Heel effect ● Beam limiting devices 	
III	<ul style="list-style-type: none"> ● Introduction & Handling of Portable and Non- Portable equipment ● Maintenance and care of all X-Ray equipment and accessories 	8
IV	<ul style="list-style-type: none"> ● Basics of radioactivity ● Ionising Radiation and its quantities and units. ● Interaction quantities , Linear attenuation co-efficient, mass attenuation co-efficient ● Thermionic emission 	10
TOTAL		48

Text Book:

3. Textbook of Radiology Physics, Hariqbal singh, Roshan Lodha jaypee publishers
4. Christensen's physics of diagnostic radiology, 4th edition

Reference Books:

3. Holmberg O, Malone J, Rehani M, McLean D, Czarwinski R. Current issues and actions in radiation protection of patients.

4. Radiation physics for Nuclear Medicine edited by Marie Clarie, Christoph Hoeschen, Springer.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
90 NCH	-	30 NCH Group discussion Quiz Home assignments Projects

Level: Semester IV

Title of the Paper: Special Radiographic Procedure	Course: Major
Subject Code: RIT242M412	Course Level: 200
Scheme of Evaluation: Practical	
L-T-P-C: 0-0-8-4	Total Credits: 4

Objective: The aim of this course is to allow students to learn how to approach different radiographic positions for special procedures and apply the same in achieving the best possible images with minimum exposure.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the principle of contrast media, its the composition and adverse reactions	BT 1
CO2	Explain different kinds of special procedures based on the different systems of the human body	BT 2

CO3	Apply the anatomical knowledge in assessing patient condition and accordingly carrying out different procedures	BT 3
CO4	Analyzing different patients complicated situations and providing drugs to relieve the patient from life threatening contrast reactions	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> Introduction to Radiographic Special Procedures Contrast Media- Application, types, safety aspects & administration, Reaction to contrast media and management of contrast reactions. 	8
II.	<ul style="list-style-type: none"> Gastrointestinal tract: Barium series :Barium swallow, Barium meal , Barium meal follow through (BMFT) , Barium enema 	12
III	<ul style="list-style-type: none"> Urinary system: Indications, contraindications procedure and technique of : Intravenous urogram (IVU), Micturating Cystourethrogram (MCU), Ascending Urethrogram (ASU)/ RGU , Hysterosalpingography (HSG), lithotripsy 	14
IV	<ul style="list-style-type: none"> Billiary tract: Oral cholecystography, Intravenous cholecystography, T-tube cholangiogram, Myelogram, Fistulogram, Polytrauma 	14
TOTAL		48

Text Book:

1. Davies SG, Chapman S. Aids to radiological differential diagnosis, 6th edition, Saunders Publishers

Reference Books:

1. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures, 4th edition,. Elsevier Health Sciences
2. Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	90 NCH	30 NCH Case Study Hospital Visit Seminar - Projects

Level: Semester IV

Title of the Paper: Radiation Hazards & Protection	Course: Major
Subject Code: RIT242M403	Course Level: 200
Scheme of Evaluation: Theory	
L-T-P-C: 3-1-0-4	Total Credits: 4

Objective: The aim of this course is to allow students to learn about a brief introduction of Yoga & important streams, history, basis of different yoga and to elaborate type of treatment related to disease with Asanas & Pranayamas.

Course Outcome:

Upon completion of the course student shall be able to:
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CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the origin and history of yoga	BT 1
CO2	Explain the various types of asanas and the treatment offered by them	BT 2
CO3	Apply various yogic asanas and pranayamas in ones own self and others to reap out the benefits	BT 3
CO4	Analyzing the effects of yoga on body, mind and soul	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I	Introduction to Radiation Protection, Units & Quantities- Primary, secondary radiation, need for radiation protection, Exposure, Absorbed dose, absorbed dose equivalent, Effective dose, air KERMA, Radiation weighting factor, Tissue weighting factor, MPD. Aim & Principle of Radiation Protection- Concept of ALARA, Cardinal Principle, ICRP regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding	12

II.	Radiation monitoring: Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area monitoring Devices. Radiobiology: Radiolysis of water, Direct & Indirect effects of radiation, Stochastic, Deterministic effects, Somatic, Genetic effects, dose relationship, Antenatal exposure. 10 day rule, 14 day rule, 28 day rule, exposure control for children, mentally and physically challenged patients and lactating mothers	12
III	Care and maintenance of diagnostic equipment: General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment.	12
IV	Role of Radiographer in Planning, ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection. NABH guidelines, AERB guidelines, PNDT Act and guidelines	12
TOTAL		36

Text Book:

1. Alternative Therapies by Swati Bhagat

Refernce Book:

2. Yoga & rehabilitation by Nilima Patel

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
90 NCH		30 NCH - Meditation centre/Ashram visit - Workshops - Home Assignments

Level: Semester IV

Title of the Paper: Patient Care Management	Course: Major
Subject Code: RIT242M404	Course Level: 200
Scheme of Evaluation: Theory	
L-T-P-C: 3-0-0-3	Total Credits: 3

Objective: The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, fetal rights, research on human subjects, organ donation, and the rights of the dying and the legal definition of death.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Define ethics and its importance in the functioning of the hospital.	

		BT 1
CO2	Outline the various issues related to healthcare setup and also manage the hospital with the various issues that can arise from the legal perspective.	BT 2
CO3	Recognize and train the workforce to meet the challenges of changing dynamics in healthcare scenario in terms of the regulations that governs the operational aspects of the hospital.	BT 3
CO4	Distinguish the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice.	BT 4

Detailed Syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I	<ul style="list-style-type: none"> • Introduction to Patient Care in Radiology • Role and Responsibilities of a Radiologic Technologist • Effective Communication with Patients • Informed Consent in Imaging Procedures • Patient Identification and Verification Protocols • Medical Ethics and Professionalism in Radiology • Confidentiality and Patient Rights • Taking Medical History for Imaging • Physical Assessment and Vital Signs Monitoring • Positioning Techniques in Radiologic Examinations • Patient Preparation for General X-ray 	

	<ul style="list-style-type: none"> • Patient Preparation for CT/MRI/Ultrasound • Instructions for Fasting and Contrast Studies • Management of Special Needs Patients 	
II.	<ul style="list-style-type: none"> • Infection Control Measures in Radiology • Universal Precautions and PPE in Imaging Departments • Biomedical Waste Management in Radiology • Aseptic Techniques and Handling of Sterile Equipment • Basic Life Support (BLS) in Radiology • Management of Medical Emergencies • Handling Contrast Media Reactions • First Aid and Emergency Trolley Equipment • CPR and Use of AED in Imaging Settings • Pain Management and Patient Comfort Measures • Monitoring Claustrophobic and Anxious Patients • Post-Procedure Observation and Aftercare • Care of Immobilized or Unconscious Patients • Documentation and Reporting in Radiology • Legal Aspects of Patient Handling and Care • Handling Difficult or Non-Cooperative Patients 	

<p style="text-align: center;">III</p>	<ul style="list-style-type: none"> • Introduction to Radiation Protection • Units & Quantities- Primary, secondary radiation • Need for radiation protection • Exposure, Absorbed dose, absorbed dose equivalent, Effective dose, air KERMA • Radiation weighting factor, Tissue weighting factor, MPD • Aim & Principle of Radiation Protection- Concept of ALARA, Cardinal Principle • ICRP regulation • Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding • Radiation monitoring: Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area monitoring Devices • Radiobiology: Radiolysis of water, Direct & Indirect effects of radiation, Stochastic, Deterministic effects, Somatic, Genetic effects, dose relationship, • Antenatal exposure • 10 day rule, 14 day rule, 28 day rule • Exposure control for children, mentally and physically challenged patients and lactating mothers 	
<p style="text-align: center;">IV</p>	<ul style="list-style-type: none"> • Care and maintenance of diagnostic equipment: General principles • Preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually • Care in use, special care of mobile 	

	<p>equipment</p> <ul style="list-style-type: none"> • Role of Radiographer in Planning • ICRP, NRPB, NCRP and WHO guidelines for radiation protection • Pregnancy and radiation protection • NABH guidelines, AERB guidelines • PNDT Act and guidelines 	
TOTAL		36

Text Book:

1. Medical Ethics 2nd Edition, by CM Francis: Jaypee Brothers

Reference Books:

1. Clinical Ethics: A Practical Approach to Ethical Decisions in Clinical Medicine, 8th Edition, by Albert R. Jonsen, Mark Siegler, William J Winslade.
2. Textbook of Medical Ethics, Erich H. Loewy, M.D.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH	-	30 NCH Seminar Home assignments Case Study

Level: Semester IV

Title of the Paper: Basics of Pathology	Course: Major
Subject Code: RIT242M405	Course Level: 200
Scheme of Evaluation: Theory	
L-T-P-C: 3-0-0-3	Total Credits: 3

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the routine and special projections for all the different parts of the human body	BT 1
CO2	Explain different radiographic projections taken for different body parts	BT 2
CO3	Apply the knowledge of anatomy in producing accurate radiographs	BT 3
CO4	Create good quality accurate radiographs by using multiple projection knowledge for particular body part	BT 4

Detailed Syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p>Definitions / Terminology :</p> <p>A. Disease. ---- 1. Acute 2. Chronic</p> <p>B. Inflammation and repair -----acute inflammation (features, causes, vascular and cellular events), chronic inflammation (features, causes, types, classification with examples)</p> <p>C. Infectious diseases ---- bacterial, viral , fungal, mycobacterial, parasitic</p>	12

	<p>D. Growth disturbances --- atrophy, hypertrophy, aplasia, hyperplasia, metaplasia, dysplasia, agenesis, carcinogenesis</p> <p>E. Genetic disorders ---- basic concepts of genetic disorders and some common examples related ionising radiations.</p> <p>F. Pathogenesis</p> <p>G. Etiology</p> <p>H. Diagnosis --- 1. Signs (objective) 2. Symptoms (subjective)</p> <p>I. Prognosis</p> <p>J. Indications for procedure</p> <p>K. Manifestations of pathology</p> <p>L. Relevance to radiographic procedures</p> <ol style="list-style-type: none"> 1. Technical considerations 2. Patient consideration 	
II.	<p>Classifications (Definitions, Examples, Sites, Complications, Prognosis)</p> <p>A. Mechanics</p> <p>B. Chemicals</p> <p>C. Thermals Radiation</p>	4
III	<p>Causes of Diseases (Process, Examples)</p> <ul style="list-style-type: none"> ● Pathological ● Traumatic ● Surgical ● Healing process ● Complications <p>Genetics (caused by or contribution by genetic factors) vs. heredity</p>	8

IV	<p style="text-align: center;">Radiologic pathology</p> <p>A. Skeletal</p> <p>B. Digestive</p> <p>C. Respiratory</p> <p>D. Urinary</p> <p>E. Reproductive</p> <p>F. Circulatory</p> <p>G. Endocrine</p> <p>H. Nervous</p>	12
TOTAL		36

Text Book:

1. Robbins Basic Pathology (Robbins Pathology) Elsevier; 10th edition

Reference Books

2. Pathology: Implications for the Physical Therapist, Saunders; 4th edition

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	60 NCH	30 NCH
		<p>Hospital visit</p> <ul style="list-style-type: none"> - Presentation - Projects

Level: Semester IV

Title of the Paper: CEN IV – Employability and Communication	Course: AEC
Subject Code: CEN982A401	Course Level: 200
Scheme of Evaluation: theory and Practical	
L-T-P-C: 1-0-0-1	Total Credits: 1

Course Objectives: This course is designed to enhance employability and maximize the students' potential by introducing them to the principles that determine personal and professional success, thereby helping them acquire the skills needed to apply these principles in their lives and careers.

Course Outcomes: After the successful completion of the course, the students will be able to

CO	Course Outcome	Blooms Taxonomy Level
CO 1	Demonstrate understanding the importance of verbal and non-verbal skills while delivering an effective presentation.	BT 2
CO 2	Develop professional documents to meet the objectives of the workplace	BT 3
CO 3	Define and identify different life skills and internet competencies required in personal and professional life.	BT 3

Detailed Syllabus		
Units	Course Contents	Periods
I	Presentation Skills Importance of presentation skills, Essential characteristics of a good presentation, Stages of a presentation, Visual aids in presentation, Effective delivery of a presentation	5
II	Business Writing Report writing: Importance of reports, Types of reports, Format of reports, Structure of formal reports Proposal writing: Importance of proposal, Types of proposal, structure of formal proposals	5

	Technical articles: Types and structure	
III	<p>Preparing for jobs</p> <p>Employment Communication and its Importance, Knowing the four-step employment process, writing resumes, Guidelines for a good resume, Writing cover letters</p> <p>Interviews: Types of interview, what does a job interview assess, strategies of success at interviews, participating in group discussions.</p>	5
IV	<p>Digital Literacy and Life Skills</p> <p>Digital literacy: Digital skills for the '21st century', College students and technology, information management using Webspaces, Dropbox, directory, and folder renaming conventions. Social Media Technology and Safety, Web 2.0.</p> <p>Life Skills: Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem-solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion.</p> <p>Application of life skills: opening and operating bank accounts, applying for pan, passport, online bill payments, ticket booking, gas booking</p>	5

Keywords: Employability, business writing, presentation skills, life skills

Text:

1. Business Communication by PD Chaturvedi and Mukesh Chaturvedi

References:

1. Business Communication by Shalini Verma

2. Technical Communication by Meenakshi Raman and Sangeeta Sharma

Credit Distribution		
Lecture/Tutorial	Practicum	Experiential Learning
15 hours	-	10 hours <ul style="list-style-type: none"> - Movie/ Documentary screening - Field visits - Peer teaching - Seminars - Library visits

Title of the Paper: Behavioural Sciences -IV	Course: AEC
Subject Code: BHS982A304	Course Level: 200
Scheme of Evaluation: Theory	L-T-P-C: 1-0-0-1
Total Credits: 1	

Course objectives: To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations.

Course outcomes: On completion of the course the students will be able to:
 CO1: Understand the importance of individual differences
 CO2: Develop a better understanding of self in relation to society and nation
 CO3: Facilitation for a meaningful existence and adjustment in society

Modules	Course Contents	Periods

I	<p>Managing Personal Effectiveness</p> <p>Setting goals to maintain focus, Dimensions of personal effectiveness (self disclosure, openness to feedback and perceptiveness), Integration of personal and organizational vision for effectiveness, A healthy balance of work and play, Defining Criticism: Types of Criticism, Destructive vs Constructive Criticism, Handling criticism and interruptions.</p>	4
II	<p>Positive Personal Growth</p> <p>Understanding & Developing positive emotions, Positive approach towards future, Impact of positive thinking, Importance of discipline and hard work, Integrity and accountability, Importance of ethics in achieving personal growth.</p>	4
III	<p>Handling Diversity</p> <p>Defining Diversity, Affirmation Action and Managing Diversity, Increasing Diversity in Work Force, Barriers and Challenges in Managing Diversity.</p>	4
IV	<p>Developing Negotiation Skills</p> <p>Meaning and Negotiation approaches (Traditional and Contemporary) Process and strategies of negotiations. Negotiation and interpersonal communication. Rapport Building – NLP.</p>	4
Total		16

Text books:

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer & Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

Semester V

Subject Name: Computed Tomography

Subject Code: RIT242M501

L-T-P-C – 4-0-0-4

Credit Units: 4

Scheme of Evaluation: T

Objective: This course has been formulated to develop knowledge on basic principles of Computed tomography, radiographic projection and positioning.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the historical facts related to computed tomography and its importance in the medical field	BT 1
CO2	Understand the basic principle of Computed tomography	BT 2
CO3	Develop the skill for producing images in computed tomography	BT 2
CO4	Apply the knowledge of protection and safety in CT scan to produce images maintaining the radiation safety	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none">• Introduction to Computed Tomography and Principle of Computed Tomography History, Advantage and Disadvantages of CT, Basic principle of CT ,	10

	Generations of Computed Tomography- 1st generation, 2nd generation, 3rd generation, Slip ring technology, 4th generation, Electron beam CT, Dual Source CT, Flat Panel Detector CT Single and Multi slice Technology	
II.	<ul style="list-style-type: none"> • Instrumentation-CT scanner gantry, Detectors & Data Acquisition System, Generator, Computer and image processing System Image display system, storage, recording and communication system, CT control console, Options and accessories for CT systems • Image Reconstruction- Basic principle, Reconstruction algorithms, Image reconstruction from projections, Types of data reconstruction Image Display and Image Quality Image formation and representation, Image processing, Pixel and voxel, CT number Window level and window width, Qualities, Resolution, Contrast, Sharpness, Noise properties in CT 	16
III	<ul style="list-style-type: none"> • CT Artefacts- Classification, Types, Causes, Remedies 	8
IV	<ul style="list-style-type: none"> • Patient preparation, patient positioning, performing all non-contrast and contrast computed tomography procedures • Radiation protection and care of patient during procedures including contrast media Management in CT • Various post processing techniques and evaluation of image quality and clinical findings. • Post procedural care of the patient 	14

TOTAL	48
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Text Book:

1. Step by step CT Scan by D Karthikeyan, Deepa Chegu (Jaypee Publishers)

Reference Books:

1. Textbook of Radiology for Residents and Technician, Satish K Bhargava, Sumeet Bhargava, Fifth edition, CBS Publishers & Distributors Pvt. Ltd.
2. Radiology 101, The Basics and Fundamentals of Imaging, 4th Edition, Wilbur L. Smith, Thomas A. Farrell.

References:

1. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical Applications, and Quality Control. Elsevier Health Sciences; 2015
2. Kak AC, Slaney M. Principles of computerized tomographic imaging. Society for Industrial and Applied Mathematics; 2001

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

Semester V

Subject Name: Techniques of Mammography & Fluoroscopy		Subject Code: RIT242M502
L-T-P-C – 4-0-0-4	Credit Units: 4	Scheme of Evaluation: T

Objective: This course has been formulated to Impart basic knowledge of breast imaging using mammography imaging, mineral density using BMD and other recent advancement related to them.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the historical facts related to mammography and its importance in the medical field	BT 1
CO2	Understand the basic principle of mammography and bone mineral density	BT 2
CO3	Explain the procedure for producing images in mammography and BMD	BT 3
CO4	Apply the knowledge of protection and safety in each modality to produce images maintaining the radiation safety	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> History of mammography and its applications 	8
II.	<ul style="list-style-type: none"> Mammography: Mammography Equipment's and Basic views in Mammography 	14

III	<ul style="list-style-type: none"> Clinical Practice Scanning protocol, Indication, Patient preparation, image quality and artifacts in and Mammography 	14
IV	<ul style="list-style-type: none"> Fluoroscopy and Image Intensifiers: Direct fluoroscopy, fluoroscopy image, fluoroscopic screen, explorators (serial changers, spot film devices) and accessories. Radiation protection including integrating timer. Tilting tables. Principles and Construction of Image Intensifiers, Television Camera Tubes and Cathode Ray Tubes. Recording the intensified image, methods of viewing the intensified image, equipment for fluorography and cine-fluorography. Radiographic and fluoroscopic tables, telecommand tables. Equipment for Special Procedures: Special trolleys and chairs, portable and mobile x-ray units, cordless mobile x-ray equipment, capacitor discharge mobile equipment, cranial and dental equipment, skull tables, mammography, mass-miniature radiography, multi section cassettes, rapid cassette change, rapid film changer, magnification radiography, subtraction radiography. 	10
TOTAL		48

Text Book:

1. Ross & Galloway: A Hand Book of Radiography (Lewis)

Reference Books:

1. Scarrow: Contrast Radiography (Schering Chemicals)

2.Vanderplasts : Medical X-Ray Technique (Mac Millan)

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

Subject Name: Basics of Ultrasound		Subject Code: RIT242M503
L-T-P-C – 4-0-0-4	Credit Units: 4	Scheme of Evaluation: T

Objective: This subject is designed to impart fundamental knowledge on the structure of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of anatomy.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the principles and concepts of ultrasonography and the physics behind the generation of images	BT 1
CO2	Explain and demonstrate various procedures guided by ultrasound	BT 2
CO3	Apply the anatomical and technical knowledge to find out the cause of illness	BT 3

CO4	Create awareness of the value and benefits of ultrasound among patients, health care providers and insurers	BT 6
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Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> ● Principle & history of Ultrasound, advantages and disadvantages of ultrasound, Types of Ultrasound, Equipment description ● Mode of USG & its type 	8
II.	<ul style="list-style-type: none"> ● Indication and Clinical Application ● Physics of ultrasound imaging, Physics of transducers, construction & its type, Physics of Doppler USG & its type ● Ultrasound tissue characterization ● Potential for three dimensional ultrasound 	6
III	<ul style="list-style-type: none"> ● Artifacts in ultrasound ● Comparison of ultrasound equipment Computerization of data, Image recording, ● Ultrasound jelly & Safety of ultrasound ● USG Contrast Media-Types of Ultrasound Contrast media and its advantages <p>Care & maintenance QA & QC & USG equipment</p>	
IV	<ul style="list-style-type: none"> ● Echocardiography ● Equipment, Introduction, indication and image formation. <p>Uses of colour Doppler in echocardiography and equipment description with transducer.</p>	
TOTAL		36

Text Book:

1. Textbook of diagnostic ultrasonography. Hagen-Ansert SL. Mosby Elsevier

Reference Books:

1. Introduction to ultrasound. Zwiebel WJ, Sohaey R, Saunders publishers
2. Handbook of ultrasound, GS Garkal, 2nd edition, Jaypee Publishers

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

Subject Name: Pharmacology	Subject Code: RIT242M504	
L-T-P-C – 3-1-0-4	Credit Units: 4	Scheme of Evaluation: T

Objective: This subject is designed to impart fundamental knowledge on the structure of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of anatomy.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the concepts of pharmacodynamics, pharmacokinetics, classification and the principles of drug administration	BT 1

CO2	Describe drugs used in de-addiction, emergency, deficiency of vitamins and minerals, poisoning, and various body systems	BT 2
CO3	Explain the chemotherapy of specific infections and infestations and nurses responsibilities	BT 2
CO4	Apply the knowledge of pharmacology in raising awareness of common drugs used in alternatives system of medicine	BT 3

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p>Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.</p> <p>b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination</p>	12
II.	<p>Pharmacology of drugs acting on central nervous system</p> <p>a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.</p> <p>b. General anesthetics and pre-anesthetics.</p> <p>c. Sedatives, hypnotics and centrally acting muscle relaxants.</p>	10

	<p>d. Anti-epileptics</p> <p>e. Alcohols and disulfiram</p>	
III	<p>Pharmacology of drugs acting on peripheral nervous system</p> <p>a. Organization and function of ANS.</p> <p>b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.</p> <p>c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.</p> <p>d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).</p> <p>e. Local anesthetic agents.</p> <p>f. Drugs used in myasthenia gravis and glaucoma</p>	12
IV	<p>a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.</p> <p>b. Adverse drug reactions.</p> <p>c. Drug interactions (pharmacokinetic and pharmacodynamic)</p>	14

	d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.	
TOTAL		48

Text Book:

1.Kulkarni SK Handbook of Experimental pharmacology – Vallabh Prakashan

Reference Books:

1. Rang H. P., Dale M. M., Ritter J. M., Flower R J, Rang and Dale’s Pharmacology, Chrchil Livingstone Elsevier.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

SEMESTER V

Title of the Paper: Medical Law & Ethics	Course: Major
Subject Code: RIT242M505	Course Level: 200
Scheme of Evaluation: Theory	
L-T-P-C: 3-1-0-4	Total Credits: 4

Objective: The aim of this course is to allow students to learn how to approach different radiographic positions for special procedures and apply the same in achieving the best possible images with minimum exposure.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the principle of contrast media, its the composition and adverse reactions	BT 1
CO2	Explain different kinds of special procedures based on the different systems of the human body	BT 2
CO3	Apply the anatomical knowledge in assessing patient condition and accordingly carrying out different procedures	BT 3
CO4	Analyzing different patients complicated situations and providing drugs to relieve the patient from life threatening contrast reactions	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> Introduction: Basics of Medical Ethics, Values in medicine, ethical problems and the medical profession, goals of medical intervention, patient-doctor relationship 	8

II.	Codes of Conduct: historical perspective, international codes of medical ethics- duties of physicians to the sick and to each other	12
III	<ul style="list-style-type: none"> Informed consent, right of patients- right to life, female foeticide, gender determination, reproductive technologies- adoption, AID, IVF, GIFT, SIFT, surrogacy, ICMR guidelines 	14
IV	<ul style="list-style-type: none"> Introduction: Basic definition and goals, medical profession definition and criteria, clinical ethics, ethical problems, core curriculum for medical ethics and law, code of conduct, malpractice and negligence, UN principles of medical ethics, irrational drug therapy 	14
TOTAL		48

Text Book:

1. Medical Ethics 2nd Edition, by CM Francis: Jaypee Brothers

Reference Books:

1. Clinical Ethics: A Practical Approach to Ethical Decisions in Clinical Medicine, 8th Edition, by Albert R. Jonsen, Mark Siegler, William J Winslade.
2. Textbook of Medical Ethics, Erich H. Loewy, M.D.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	90 NCH	30 NCH <ul style="list-style-type: none"> - Case Study - Hospital Visit - Seminar - Projects

Semester VI

Subject Name: Magnetic Resonance Imaging

Subject Code: RIT242M601

L-T-P-C – 3-1-0-4

Credit Units: 4

Scheme of Evaluation: T

Objective: This course has been formulated to develop knowledge on basic principles of Computed tomography, Radiographic projection and positioning. This course has been formulated to develop knowledge on working principle, instrumentation and clinical applications of MRI.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the history of different diagnostic modalities of radiology department, their inventors and other important facts on recent advancement	BT 1
CO2	Understand the working principle and physic behind the image formation in CT, MRI and BMD	BT 2
CO3	Explain the procedure of patient positioning and the technical aspects of each modality	BT 2

CO4	Apply the specific knowledge relating to that particular modality in the production of good quality image to aid in diagnosis	BT 4
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Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> Introduction and Basic Principle of Magnetic Resonance Imaging History of MRI, Electricity & Magnetism, Laws of magnetism, Atomic structure, Motion within the atom, The Hydrogen nucleus, Precession, Larmor equation, Resonance, MR signal, Free induction decay signal, Relaxation, T1 recovery, T2 decay, Pulse timing & parameters. 	4
II.	<ul style="list-style-type: none"> MRI Hardware Introduction, Permanent magnets, Electromagnets, Super conducting magnets, Fringe fields, Shim coils, Gradient coils, Radio-frequency coils, the pulse control units, Patient transportation system, Operator interface Encoding, Data collection & Image formation Introduction, Gradients, Slice selection, Frequency encoding, Phase encoding, Scan timing, Sampling, data space, k-space, k-space filling and fast Fourier transformation. 	6
III	<ul style="list-style-type: none"> MRI Artefacts Introduction, Phase miss-mapping, Aliasing or wrap around, Chemical shift artefact, Chemical misregistration, Truncation artefact/Gibbs phenomenon, Motion of the patient Magnetic susceptibility artefact, Magic angle artefact, Zipper 	8

	<p>artefact, shading artefact Cross excitation and cross talk MRI contrast agents</p> <ul style="list-style-type: none"> • Flow Phenomena & MRI angiography Introduction, The mechanisms of flow, Time of flight phenomenon, Entry slice phenomenon, Intravoxel Dephasing. Flow phenomena compensation-Gradient moment rephrasing, Pre saturation, Even echo rephrasing, MR Angiography 	
IV	<ul style="list-style-type: none"> • Patient preparation, patient positioning, performing all non-contrast and contrast MRI procedures • Planning of different scanning planes, parameters and their tradeoffs & patient monitoring during the procedures. • Various post processing techniques and evaluation of image quality and clinical findings. • Post procedural care of the patient. 	6
TOTAL		24

Text Book:

1.Christensen, Curry & Dowdey: An Introduction of Physics To Diagnostic Radiography (Lea & Febiger)

Reference Books:

- 1.Step by Step MRI by J Jagan Mohan Reddy , V Prasad Jaypee Publishers.
2. MRI in practice, 4th Edition by Catherine Westbrook, Carolyn Kaut Roth, John Talbot , Wiley-Blackwell.

Subject Name: Basics of Radiotherapy	Subject Code: RIT242M602
L-T-P-C – 3-1-0-4	Credit Units: 4
	Scheme of Evaluation: T

Objective: This objective of the course is to impart basic knowledge of nuclear imaging and expose students to developments of recent technologies in the field of diagnosis.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the basic principles of radiotherapy and basics of radioactivity	BT 1
CO2	Understand the basic principle and advances of nuclear imaging and its diagnostic value	BT 2
CO3	Explain the procedures of producing different radionuclides using different nuclear reactors	BT 2
CO4	Apply the knowledge of radiotherapy in producing images of the target organs and treatment of certain diseases	BT 3

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> Introduction to NMT and Radioactive Transformation Basic atomic and nuclear physics, History of radioactivity, Units & quantities, Isotopes, Isobars, Isomers, Radioactivity and half-life, Exponential decay, specific activity, Modes of Radioactive decay, parent daughter decay. 	12

II.	<ul style="list-style-type: none"> Production of Radio nuclides Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators 	8
III	<ul style="list-style-type: none"> Radio pharmacy & Handling & Transport of Radionuclides Cold kits, Radio pharmacy used in Nuclear medicine, Radiopharmaceuticals used in various procedures, Safe handling of radioactive materials, Procedures for handling spills 	14
IV	<ul style="list-style-type: none"> Equipments of Radiotherapy Gamma camera, PET, SPECT 	12
TOTAL		48

Text Book:

1. Waterstram-Rich KM, Gilmore D. Nuclear Medicine and PET/CT-E-Book: Technology and Techniques. Elsevier Health Sciences; 2016

Reference Books:

1. Principle and practice of Nuclear medicine and correlative medical imaging, RD lele, Jaypee publishers.

2. Walter and Miller's Textbook of Radiotherapy, Radiation Physics, Therapy and Oncology, 8th Edition, Paul Symonds, John A. Mills, Angela Duxbury.

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

Subject Name: Biostatistics and Research Methodology	Subject Code: RIT242M603
L-T-P-C – 3-1-0-4	Credit Units: 4
	Scheme of Evaluation: T

Objective: 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.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the principal concepts about bio-statistics and research methodology	BT 1
CO2	Recognize the definition of statistics, the subjects and its relation with other sciences	BT 2
CO3	Explain the various process of data collection and sampling	BT 2

CO4	Apply the testing methods on formulating precise data relating to the particular research	BT 4
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Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> Introduction: Introduction to research methodology: meaning, objectives of research, types of research, research approaches, significance of research, research process, criteria of good research, Defining research problem: selecting the problem necessity and techniques in defining the problem. 	8
II.	<ul style="list-style-type: none"> Research, sample design and data collection: Research Design: need and features of good design, types, basic principles of experimental design, developing a research plan. Sample design: criteria for selecting a sample procedure, characteristics of good sampling procedure types of sample design, selecting random samples. Methods of data collection: Collection of primary data, observation method, interview method, collection of data through questionnaire and schedules and other methods. Collection of secondary data, selection of appropriate method for data, collection, case study method, guidelines for developing questionnaire, successful interviewing, survey vs. experiment. Processing and analysis of data: data analysis (elements), statistics in research, measures of central tendency, dispersion, asymmetry, regression analysis, multiple correlation and regression, partial correlation, and association in case attributes. 	14

III	<ul style="list-style-type: none"> • Sampling Fundamentals: Definition, need, central limit theorem, sampling theory, the concept of standard error, estimation, estimating population mean, proportion, sample size and its determination. 	14
IV	<ul style="list-style-type: none"> • Testing of hypothesis: Meaning basic concepts, important parametric tests, limitations of tests of hypothesis. Chi-square test: Applications, steps characteristics, limitations. Analysis of variance and co-variance: basic principles, techniques, applications, assumptions and limitations. Analysis of non-parametric tests 	10
TOTAL		48

Text Book:

1.ABC of Research Methodology and Applied biostatistics by MN Parikh and Nithya Gogtay

Reference Books:

1.Comprehensive text book of Biostatistics and Research Methodology by Dr. S. Kartikeyan.

2. Introduction to Biostatistics (A Textbook of Biometry) by Dr. Pranab Kumar Banerjee , S Chand.

Subject Name: Interventional Radiology	Subject Code: RIT242M604
L-T-P-C – 3-1-0-4	Credit Units: 4
	Scheme of Evaluation: T

Objective: The objective of this course is to equip students with advanced knowledge and practical expertise in modern radiological imaging modalities and interventional techniques, with a focus on clinical application, image quality optimization, and patient safety.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the advanced principles and physics behind modalities like MRI, CT, and Interventional Radiology	BT 1
CO2	Explain imaging protocols, equipment components, and patient care techniques in advanced imaging systems	BT 2
CO3	Apply the anatomical and technical knowledge to find out the cause of illness	BT 3
CO4	Create awareness of the value and benefits of ultrasound among patients, health care providers and insurers	BT 6

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> • Introduction to interventional radiology • Need for interventional procedures <p style="text-align: center;">Informed consent</p>	8
II.	<p style="text-align: center;">Equipment</p> <ul style="list-style-type: none"> • History and overview of angiography, Basics of Angiographic equipment: Single and biplane 	6

	<p>angiographic equipment Angiographic Table, Image intensifier, Flat panel detector, Recording systems,</p> <ul style="list-style-type: none"> • Cardiac resuscitation measures - ECG Pressure injector, Catheters, needles, stents, and other tools 3-D rotational angiography, Image processing, Patient monitor, ACT equipment <p>Advancement in interventional radiology</p>	
III	<p>Procedure: -</p> <ul style="list-style-type: none"> • Coronary angiography & angioplasty, cardiac • Cardiac cauterization, image • Image-guided biopsy/fnac/drainage, four • Four vessel DSA & aortogram, embolic Embolism agents, patient preparation, post-procedure care, the role of the radiographer in an interventional procedure 	14
IV	<ul style="list-style-type: none"> • Catheters, guide wires & stents • Venography • Vertebroplasty and kyphoplasty • RF ablation • Crash cart – emergency drugs 	8
TOTAL		36

Text Book:

1. Kandarpa K, Machan L, editors. Handbook of interventional radiologic procedures. Lippincott Williams & Wilkins

Reference Books:

1. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013

2. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures, 4th edition,. Elsevier Health Sciences

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60 NCH		30 NCH - Lab visit - Home assignments - Projects

Subject Name: Clinical Posting	Subject Code: RIT242M625
L-T-P-C – 0-0-8-4	Credit Units: 4
	Scheme of Evaluation: P

Objective: The objective of this course is to educate the students and prepare them for future real-life situations and to enhance the delivery of health care in the Radiology Department.

1. Students will observe the basic functioning of the different modalities present in the Radiology department. They will be introduced to terminologies, equipments and techniques for preparation and management.
2. Students will gain additional skills in clinical preparation, interaction with patients and professional personnel. Students will apply knowledge from previous clinical learning experiences under the supervision of a senior technical officer.
3. Students will improve their skills in clinical procedures. Progressive interaction with patients and professional personnel are monitored a students practice in a supervised setting. Additional areas include problem-solving, identifying machine components and basic side-effect management.
4. The course provides students the opportunity to continue to develop advanced problem solving skill. Students will demonstrate competence in beginning, intermediate and advanced procedures.

SEMESTER VII

Subject Name: Techniques of Routine X-rays	Subject Code: RIT242M711
L-T-P-C – 0-0-10-5	Credit Units: 5
	Scheme of Evaluation: P

Objective: This subject is designed to impart fundamental knowledge on the structure of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of anatomy.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the routine and special projections for all the different parts of the human body	BT 1
CO2	Explain different radiographic projections taken for different body parts	BT 2
CO3	Apply the knowledge of anatomy in producing accurate radiographs	BT 3
CO4	Create good quality accurate radiographs by using multiple projection knowledge for particular body part	BT 6

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
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<p>I.</p>	<p>Upper-limb:</p> <p>Routine projections for the whole Hand, Fingers, Wrist Joint, Forearm, Elbow Joint and Humerus. Supplementary projections for scaphoid, carpal tunnel ball catchers projections, head of the Radius, Supracondylar Fracture and Olecranon Process.</p> <p>Lower limb:</p> <p>Routine Projections For The Whole Foot, Toes, Calcaneum, Ankle Joint, Leg, Knee-Joint, Patella and Femurs. Supplementary Projections For Talo-Calcaneal Joint, Forced Projections For Torn Ligaments, Flat Feet, Club Feet, Intercondylar Projections For Loose Bodies In The Knee, Axial Projection For Patella.</p>	<p>8</p>
<p>II.</p>	<p>Pectoral Girdle and Thorax:</p> <p>Routine Projections For Shoulder Joint, Scapula, Acromio-Clavicular Joint, Clavicle, Sternoclavicular Joint, Sternum and Ribs.</p> <p>Supplementary Projections For The Axial Projections of Clavicle, Bicipital Groove Carotid Process, Classification of Tendons, Subluxation, Upper Ribs and Axillary Ribs.</p> <p>Pelvic Girdle and Hip Region:</p> <p>Routine Projections For The Whole Pelvis, Sacro-Ileac Joints, Hip Joint and Neck of Femur.</p> <p>Supplementary Projections For The Greater and Lesser Trochanters of Femur. Frog Leg Projection, Ischeum Symphysis Pubis, Ileum, Accetabulum and Congenital Dislocation of Hip Arthrodesis.</p>	<p>14</p>
<p>III</p>	<p>Abdomen:</p> <p>Kub, Erect Abdomen and Decubitus Projection, Supplementary Projections For Acute Abdomen.</p>	<p>8</p>

IV	<p>Chest:</p> <p>Routine Projections For Lungs, Cardia and Diaphragm. Supplementary Projections For Opaque Swallow, Thoracic Inlet, Soft Tissue Neck, Decubitus, Apicugrams, Paediatric Cases.</p>	12
TOTAL		48

Text Book:

1. Textbook of diagnostic ultrasonography. Hagen-Ansert SL. Mosby Elsevier

Reference Books:

1. Introduction to ultrasound. Zwiebel WJ, Sohaey R, Saunders publishers
2. Handbook of ultrasound, GS Garkal, 2nd edition, Jaypee Publishers

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	90 NCH	30 NCH - Lab visit - Home assignments - Projects

Subject Name: Techniques of Special X-rays		Subject Code: RIT242M712
L-T-P-C – 0-0-8-4	Credit Units: 4	Scheme of Evaluation: P

Objective: The aim of this course is to allow students to learn how to approach different radiographic positions for special procedures and apply the same in achieving the best possible images with minimum exposure.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the principle of contrast media, its the composition and adverse reactions	BT 1
CO2	Explain different kinds of special procedures based on the different systems of the human body	BT 2
CO3	Apply the anatomical knowledge in assessing patient condition and accordingly carrying out different procedures	BT 3
CO4	Analyzing different patients complicated situations and providing drugs to relieve the patient from life threatening contrast reactions	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> Introduction to Radiographic Special Procedures Contrast Media- Application, types, safety aspects & administration, Reaction to contrast media and management of contrast reactions. 	8
II.	<ul style="list-style-type: none"> Gastrointestinal tract: Barium series :Barium swallow, Barium meal , Barium meal follow through(BMFT) , Barium enema 	12

III	<ul style="list-style-type: none"> Urinary system: Indications, contraindications procedure and technique of : Intravenous urogram (IVU), Micturating Cystourethrogram (MCU), Ascending Urethrogram (ASU)/ RGU , Hysterosalpingography (HSG), lithotripsy 	14
IV	<ul style="list-style-type: none"> Biliary tract: Oral cholecystography, Intravenous cholecystography, Percutaneous transhepatic choledochograohy, endoscopic retrograde choelochopancreatography 	14
TOTAL		48

Text Book:

- Davies SG, Chapman S. Aids to radiological differential diagnosis, 6th edition, Saunders Publishers

Reference Books:

- Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures, 4th edition,. Elsevier Health Sciences
- Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013 .

CREDIT DISTRIBUTION		
THEORY/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
	90 NCH	30 NCH
		<ul style="list-style-type: none"> - Lab visit - Home assignments - Projects

Subject Name: Techniques of Ultrasound

Subject Code: RIT242M13

L-T-P-C – 0-0-8-4

Credit Units: 4

91

Scheme of Evaluation: P

Objective: The aim of this course is to enable students to understand the principles and practical techniques of ultrasound imaging, including patient preparation, equipment handling, and positioning for optimal image acquisition across different organ systems

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the basic principles of ultrasound, types of transducers, and modes of ultrasound	BT 1
CO2	Explain ultrasound techniques applied to different organ systems and pathological conditions	BT 2
CO3	Apply anatomical and sonographic knowledge in patient positioning and image acquisition	BT 3
CO4	Analyze sonographic findings and correlate with clinical information for diagnostic accuracy	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction to Ultrasound: Basic principles, sound wave physics, transducers, image modes (A, B, M-mode, Doppler), artifacts, safety aspects, and patient preparation	8

II.	Abdominal Ultrasound: Liver, gallbladder, pancreas, spleen, kidneys, and urinary bladder — scanning techniques and pathologies	12
III	Pelvic and Obstetric Ultrasound: Female pelvic organs, early and late pregnancy evaluation, fetal biometry, placenta assessment.	14
IV	Small Parts and Vascular Ultrasound: Thyroid, breast, scrotum, vascular Doppler studies (carotid, peripheral arteries/veins)	14
TOTAL		48

Text Book:

1. Sanders RC. Clinical Sonography: A Practical Guide, 5th Edition, Lippincott Williams & Wilkins

Reference Books:

1. Rumack CM, Wilson SR, Charboneau JW, Levine D. Diagnostic Ultrasound, 4th Edition, Elsevier Health Sciences
2. Hagen-Ansert SL. Textbook of Diagnostic Sonography, 8th Edition, Elsevier

Subject Name: Techniques of Mammography	Subject Code: RIT242M14
L-T-P-C – 0-0-8-4	Credit Units: 4
	Scheme of Evaluation: P

Objective: The aim of this course is to train students in the fundamental principles and practical skills involved in mammography, including breast anatomy, patient positioning, equipment use,

image acquisition, and radiation safety, to ensure high-quality diagnostic breast imaging with minimal radiation exposure.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the basic principles of mammography, breast anatomy, and types of breast tissues	BT 1
CO2	Explain the operation of mammography equipment and imaging techniques	BT 2
CO3	Apply knowledge of positioning techniques and protocols for standard and advanced mammographic views	BT 3
CO4	Analyze mammographic images for quality assurance and correlate findings with clinical symptoms	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction to Mammography: History, principles of breast imaging, breast anatomy, and physiology	8
II.	Mammographic Equipment & Techniques: Components of mammography systems, compression, grids, AEC, digital mammography	12

III	Imaging Protocols and Positioning: Standard views (CC, MLO), supplementary views, patient preparation, and handling	14
IV	Image Evaluation and Advanced Techniques: Image quality assessment, dose management, breast density, CAD, DBT, stereotactic biopsy, QC procedures	14
TOTAL		48

Text Book:

1. Bassett LW, Mahoney MC, Apple SK. Breast Imaging: The Requisites, 3rd Edition, Elsevier

Reference Books:

1. Reddy M. Principles and Practice of Mammography, Jaypee Brothers

Subject Name: Techniques of Fluoroscopy		Subject Code: RIT242M715
L-T-P-C – 0-0-8-4	Credit Units: 4	Scheme of Evaluation: P

Objective: The aim of this course is to provide students with theoretical knowledge and practical skills related to fluoroscopy, including equipment operation, radiation safety, contrast administration, patient positioning, and image interpretation in dynamic imaging procedures.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL

CO 1	Remember the basic principles of fluoroscopy and associated radiation physics	BT 1
CO2	Explain the design and functioning of fluoroscopic equipment and its clinical applications	BT 2
CO3	Apply proper positioning, contrast administration, and procedure protocols in fluoroscopic imaging	BT 3
CO4	Analyze fluoroscopic images for diagnostic information and identify radiation safety concerns	BT 4

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction to Fluoroscopy: Definition, history, principles of image intensification, components of fluoroscopic units	8
II.	Clinical Applications: GI tract studies (barium swallow, meal, enema), myelography, arthrography, angiography, and others	12
III	Procedure Techniques: Patient preparation, contrast media usage, positioning, dynamic studies, and documentation	14
IV	Radiation Protection and Quality Control: Dose reduction techniques, shielding, time/distance considerations, QA/QC protocols	14
TOTAL		48

Text Book:

1. Bushong SC. Radiologic Science for Technologists: Physics, Biology, and Protection, 11th Edition, Elsevier

Reference Books:

1. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures, 14th Edition, Elsevier

Semester VIII**Subject Name: Techniques of CT****Subject Code: RIT242M811****L-T-P-C – 0-0-14-7****Credit Units: 7****Scheme of Evaluation: P**

Objective: This course has been formulated to develop knowledge on basic principles of Computed tomography, projection and positioning.

Course Outcome: Upon completion of this course the student should be able to:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the historical facts related to computed tomography and its importance in the medical field	BT 1
CO2	Understand the basic principle of Computed tomography	BT 2
CO3	Develop the skill for producing images in computed tomography	BT 2

CO4	Apply the knowledge of protection and safety in CT scan to produce images maintaining the radiation safety	BT 4
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Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Remember the basic principles and components of CT imaging systems	10
II.	Explain CT imaging protocols for different anatomical regions and pathological conditions	16
III	Apply positioning techniques, contrast protocols, and scanning parameters in routine CT exams	8
IV	Analyze CT images for quality assurance and interpret scan findings with respect to pathology	14
TOTAL		48

Text Book:

1. Step by step CT Scan by D Karthikeyan, Deepa Chegu (Jaypee Publishers)

Reference Books:

1. Textbook of Radiology for Residents and Technician, Satish K Bhargava, Sumeet Bhargava, Fifth edition, CBS Publishers & Distributors Pvt. Ltd.

2. Radiology 101, The Basics and Fundamentals of Imaging, 4th Edition, Wilbur L. Smith, Thomas A. Farrell.

References:

3. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical Applications, and Quality Control. Elsevier Health Sciences; 2015
4. Kak AC, Slaney M. Principles of computerized tomographic imaging. Society for Industrial and Applied Mathematics; 2001 .

Subject Name: Techniques of MRI		Subject Code: RIT242M812
L-T-P-C – 0-0-16-8	Credit Units: 8	Scheme of Evaluation: P

Objective: This course has been formulated to develop knowledge on basic principles of Computed tomography, Radiographic projection and positioning. This course has been formulated to develop knowledge on working principle, instrumentation and clinical applications of MRI.

Course Outcome:

Upon completion of the course student shall be able to:		
CO	COURSE OUTCOME	BLOOMS TAXONOMY LEVEL
CO 1	Remember the history of different diagnostic modalities of radiology department, their inventors and other important facts on recent advancement	BT 1
CO2	Understand the working principle and physics behind the image formation in CT, MRI and BMD	BT 2
CO3	Explain the procedure of patient positioning and the technical aspects of each modality	BT 2

CO4	Apply the specific knowledge relating to that particular modality in the production of good quality image to aid in diagnosis	BT 4
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Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> ● Magnetic Resonance Imaging- anatomy, planning, positioning and contrast media ● Planning MRI studies of the Head, body including angiograms 	10
II.	<ul style="list-style-type: none"> ● Various contrast media used in MRI scanning – indications, dosage, advantages & ● Disadvantages, safety screening, injection techniques ● Assessing adequacy of acquired MRI images 	16
III	<ul style="list-style-type: none"> ● Interpretation of MRI anatomical landmarks in acquired images 	8
IV	<ul style="list-style-type: none"> ● Quality assurance in MRI ● Patient preparation and communication, including MRI safety instruction 	14
	Total	48

Text Book:

1.Christensen, Curry & Dowdey: An Introduction of Physics To Diagnostic Radiography (Lea & Febiger)

Reference Books:

1. Catherine Westbrook, Carolyn Kaut Roth, John Talbot-MRI in Practice-Wiley-Blackwell
2. Catherine Westbrook - Handbook of MRI Technique-Wiley-Blackwell

Subject Name: Research Project / Dissertation**Subject Code: RIT242M822****Credit Units: 12****Scheme of Evaluation: P**

Project will be given to a group of 3-5 students. Students will be given with a research topic within the field by the supervisor. Students have to do the experimental plan, summarize the results and present the result of the project.

Project includes use of relevant scientific literature according to the topic given, students should apply experimental methods, collect data for evaluation, use appropriate statistical tools if necessary, document results by writing report. Data collection and project work can be done parallel during the last semester classes.

Student's performance shall be evaluated on written project report, a written abstract and a presentation in the department. The faculty shall submit the assessment records of each student under his/her supervision to the HOD.

