



ROYAL GLOBAL UNIVERSITY
—♦— GUWAHATI —♦—

ROYAL SCHOOL OF MEDICAL AND ALLIED SCIENCES
(RMAS)
(Bachelor of Science in Radiography & Advance Imaging Technology)

SYLLABUS
&
COURSE STRUCTURE
BSc. RIT (3Yr+1Yr Internship)

BSc. Radiography & Advance Imaging Technology

Programme Structure

1 st Semester (Part I)							
Sl. No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C101	Human Anatomy-I	3	1	0	4	4
2	RIT242C102	Human Physiology-I	3	1	0	4	4
3	RIT242C103	Biochemistry-I	3	1	0	4	4
4	RIT242C104	Hospital Duty and Patient Care-I	2	1	0	3	3
5	RIT242C111	Human Anatomy Practical	0	0	4	2	2
6	RIT242C112	Physiology-Practical	0	0	4	2	2
7	RIT242C113	Biochemistry Practical	0	0	2	1	1
Ability Enhancement Compulsory Courses (AECC)							
8	CEN982A101	Communicative English I	1	0	0	1	1
9	BHS982A104	Behavioral Science I	1	0	0	1	1
Generic Elective							
11	RIT242G101	GE-I	3	0	0	3	3
12	RIT242G101	GE-II	3	0	0	3	3
		TOTAL	16	4	10	25	32

2 nd Semester							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C201	Human Anatomy-II	3	1	0	4	4
2	RIT242C202	Hospital Duty and Patient Care-II	2	1	0	3	3
3	RIT242C203	Human Physiology-II	3	1	0	4	4
4	RIT242C204	Biochemistry-II	3	1	0	4	4
5	RIT242C211	Human Anatomy Practical	0	0	4	2	4

6	RIT242C212	Physiology-Practical	0	0	4	2	4
7	RIT242C213	Biochemistry Practical	0	0	2	1	4
Ability Enhancement Compulsory Courses (AECC)							
8	CEN982A201	Communicative English II	1	0	0	1	1
9	BHS982A204	Behavioral Science–II	1	0	0	1	1
Generic Elective							
11	RIT242G201	GE-III	3	0	0	3	3
12	RIT252G201	GE-IV	3	0	0	3	3
		TOTAL	16	4	10	25	32

3rd Semester (Part II)							
SL.N o.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C301	Basic Physics	2	1	0	3	4
2	RIT242C302	Microbiology	3	1	0	4	4
3	RIT242C303	Physics of Radiology	3	1	0	4	4
4	RIT242C304	Basic Physics Practical	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A301	Communicative English III	1	0	0	1	1
6	EVS982A303	Environmental Science	2	0	0	2	2
Ability Enhancement Elective Courses (AECC)							
7		AECC-I	2	0	0	2	2
Generic Elective							
8	RIT242G301	GE-V	3	0	0	3	3
9	RIT242G302	GE-VI	3	0	0	3	3
		TOTAL	17	3	4	25	27

4 th Semester							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C401	Radiographic Technique – I	3	1	0	4	4
2	RIT242C402	Basics of Pathology	3	1	0	4	4
3	RIT242C413	Radiographic Technique – I Practical	0	0	4	2	4
4	RIT242C414	Clinical Training – Practical	0	0	8	4	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A401	Communicative English IV	1	0	0	1	1
Ability Enhancement Elective Courses (AECC)							
6		AECC-II	2	0	0	2	2
Generic Elective							
7	RIT242G401	GE-VII	3	0	0	3	3
8	RIT242G402	GE-VIII	3	0	0	3	3
		TOTAL	15	2	12	23	25

5 th semester (Part III)							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C501	Medical Radiation Physics	3	1	0	4	4
2	RIT242C502	Radiographic Technique - II	3	1	0	4	4
3	RIT242C503	Darkroom Technique	2	1	0	3	3
4	RIT242C514	Clinical Training – Practical	0	0	8	4	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A501	Communicative English-V	1	-	-	1	1
DSE Subjects (Choose any two)							
6	RIT242D501	Biomedical Instrumentation Techniques	3	0	0	3	3
7	RIT242D502	Forensic histopathology	3	0	0	3	3

8	RIT242D503	Advances in histopathological techniques	3	0	0	3	3
9	RIT242D504	Virology and Parasitology	3	0	0	3	3
		TOTAL	15	2	8	22	22

6th semester							
Sl. No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C601	Diagnostic Imaging Technique - I	3	1	0	4	4
2	RIT242C602	Diagnostic Imaging Technique - II	3	1	0	4	4
3	RIT242C603	Radiotherapy	3	1	0	4	4
4	RIT242C614	Clinical Training – Practical	0	0	8	4	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A601	Communicative English-VI	1	-	-	1	1
DSE Subjects (Choose any two)							
6	RIT242D601	Quality Control, Radiobiology & Radiation Safety in Radiodiagnosis / Imaging	3	0	0	3	3
7	RIT242D602	Radiation Hazards, Control & Safety	3	0	0	3	3
8	RIT242D603	Recent Advances In Diagnostic Imaging	3	0	0	3	3
		TOTAL	16	3	8	23	23

Total credit for the course: 30+30+25+23+22+23=153
12 MONTH OF OF ROTATIONAL INTERNSHIP

COURSE STRUCTURE FOR BRIT

SEMESTER	CORE COURSE (14)	credit	Ability Enhancement Compulsory Course (AECC) (9)	credit	Ability Enhancement Elective Course (AEEC) (2) (Skill Based)	credit	Elective: Discipline Specific DSE (4)	credit	Elective: Generic (GE) (8)	credit	No of papers each semester	Total Credit
I	Human Anatomy	4	Comm. English – I	1	Nil	Nil	Nil	Nil	GE-1	3	11	30
	Human Physiology	4	Behavioural Science-I *	1					GE-2	3		
	Biochemistry	4										
	Hospital Duty and Patient Care	4										
	Human Anatomy Practical	2										
	Physiology-Practical	2										
	Biochemistry Practical	2										
II	Human Anatomy	4	Comm. English – II	1					GE-3	3	11	30
	Human Physiology	4	Behavioural Science-II *	1					GE-4	3		
	Biochemistry	4										
	Hospital Duty and Patient Care	4										
	Human Anatomy Practical	2										
	Human Physiology Practical	2										
	Biochemistry Practical	2										

III	Basic Physics	4	Environmental Science	2	AEEEC1	2			GE-5	3	9	25
	Physics of Radiology	4										
	Microbiology	4										
	Basic Physics Practical	2	Comm. English-III	1					GE-6	3		
IV	Radiographic Technique - I	4	Comm. English-IV	1	AEEEC2	2			GE-7	3	7	23
	Basics of Pathology	4										
	Radiographic Technique – I Practical	2										
	Clinical Training – Practical	4									GE-8	3
V	Medical Radiation Physics	4	Comm. English -V	1	Nil		DSE-1	3	Nil		7	22
	Radiographic Technique - II	4										
	Darkroom Technique	3										
	Clinical Training – Practical	4										
VI	Diagnostic Imaging Technique - I	4	Comm. English – VI	1	Nil		DSE-3	3	Nil		7	23
		4					DSE-4	3				

Diagnostic Imaging Technique - II													
Radiotherapy	4												
Clinical Training – Practical	4												

Total credit for the course: 30+30+25+23+22+23=153
1 Year Internship

Scheme of Evaluation

Theory Papers (T):

- **Internal assessment (30%)**
 Continuous Evaluation: 10%

 (Attendance: 4%, Assignment, Class Test, Viva, Seminar, Quiz : Any Three 6%)+

 Mid term (20%)
- **End Term Examination: 70%**

Practical Papers (P):

- **Internal assessment (30%)**
 Continuous Evaluation: 10%

 (Attendance:4 %, Skill Test, lab copy, viva, lab involvement 6%)

 Mid term (20%)
- **End Term Examination :**
 70%

SYLLABUS

(FIRST SEMESTER)

Objective: This subject is designed to impart fundamental knowledge on the structure and functions 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 pharmacy.

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

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction: <ul style="list-style-type: none">• Definition of anatomy and its divisions, Terms of location, positions and planes.• Cell and its organelles, Tissues & its classification, Glands.	5 hr
II.	Gastro-intestinal System: <ul style="list-style-type: none">• Parts of the GIT - mouth, pharynx, oesophagus, stomach• Abdominal cavity - divisions and regions• Liver• Pancreas• Spleen• Gall Bladder• Intestine (small and large)	10 hr

III.	<p>Musculoskeletal 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 	10 hrs
IV	<p>Cardiovascular System:</p> <ul style="list-style-type: none"> • Arteries & veins, Capillaries & arterioles. • Heart- size, location, chambers, blood supply of heart, pericardium. • Systemic & pulmonary circulation. • Major blood vessels of Heart <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. 	20 hr
TOTAL		45 hours

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

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.
3. Chatterrje, C. C. (2017). Human Physiology. 11th Edition. Kolkata: Academic Publishers.

Teaching Learning Process and Assessment Methods

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will be able to explain the gross morphology, structure and functions of various organs of the human body.	Traditional chalk and board teaching and presentations, hands-on- microscopic study of epithelial and connective tissue, muscular and nervous tissue.	Unit assessment by multiple choice questions (MCQ), internal assessments, regular question answer session.
II.	Describe the various homeostatic mechanisms and their imbalances.	Traditional chalk and board teaching, power point presentations, laboratory based identification	MCQs, regular discussions Test on structure and functions of the organ system
III	Students will be able to explain the gross morphology, structure and functions of various organs of the human body.	Traditional teaching and regular discussions and power point presentation on blood and other body fluids	Test and MCQ , assignments.
IV	Students will be able to identify the various tissues and organs of different systems of human body and appreciate coordinated working pattern of different organs of each system	Class conduction using board and power point presentation.	Test and MCQ , assignments.

Objective: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

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

1. Understand the principles of volumetric and electro chemical analysis
2. Carryout various volumetric and electrochemical titrations
3. Develop analytical skills
4. Understand the principle and applications of different electrochemical methods of analysis.

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	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, clottingfactors. - Blood groups-ABO system, Rh system, Blood transfusion- Indication, transfusion reactions. - Anaemias-classification, effects of anaemia on body. 	10 hours
II.	<p>Gastrointestinal System</p> <ul style="list-style-type: none"> - Physiological Anatomy, functions of GIT. - Salivary Gland-functions of saliva. - 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. - Hormones of GIT- Functions of Gastrin, Secretin, CCK-Pz. 	15 hours

III	Cardiovascular System <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. - Shock-Definition, Types. 	15 hours
TOTAL		40 hours

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.
3. Tandon, O.P., Tripathi, R. (2011). Best and Taylor’s Physiological basis of Medical Practice, 13th Edition, USA: Williams & Wilkins
4. Arthur, C. Guyton., Hall, E. J. (2011). Text book of Medical Physiology, 12th Edition, USA: Elseviers.
5. Grabowski, T., Palmetto, G. A. (2014). Principles of Anatomy and Physiology, 14th Edition, USA: Wiley inter-science.

Reference Books:

1. Tandon, O.P., Tripathi, R. (2011). Best and Taylor’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.
3. Chatterjee, C. C. (2017). Human Physiology. 11th Edition. Kolkata: Academic Publishers.

Teaching learning process and assessment

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Understand the physiology of blood, CVS and GI system	Traditional chalk and board teaching and power point presentations, discussions	Unit assessment by multiple choice questions (MCQ), internal assessments etc.

II.	Understand the physiology of Respiratory and Endocrine system	Traditional chalk and board teaching, power point presentations, laboratory tests	MCQs, regular discussions Tests
III	Students will able to understand the physiology of CNS, ANS and Excretory system	Traditional teaching and regular discussions and power point presentations and laboratory tests	Test and MCQ , assignments.
IV	Understand the physiology of Reproductive system, Nerve muscle.	Class conduction using board and power point presentation, laboratory tests	Regular class Tests and quizzes and assignments.

Paper III/Subject Name: Biochemistry - I (Theory)

L-T-P-C – 3-1-2-4

Scheme of Evaluation: (T/P/TP)

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

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

1. Know the basic biochemistry of carbohydrates, lipids and proteins
2. Understand the basics of electrolytes and their importance
3. Understand the basics of biophysics
4. Preparation of physical chemistry and organ function tests

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Cell: Morphology, structure & functions of cell, cell membrane, Nucleus, chromatin, Mitochondria, Endoplasmic Reticulum, Ribosomes.	5 hours
II.	Carbohydrates: Definition, chemical structure, functions, sources, classifications, Monosaccharides, Disaccharides, Polysaccharides, mucopolysaccharide and its importance, glycoproteins Carbohydrate Metabolism: Glycolysis, TCA cycle, Glycogen metabolism, Gluconeogenesis, Maintenance of Blood Glucose. Diabetes Mellitus and its complications.	15 hours
III.	Proteins: Definition, sources, amino acids, structure of protein, their classification, simple protein, conjugated protein, derived proteins and their properties. Protein Metabolism: Transamination, Deamination, Fate of ammonia, urea synthesis and its inborn errors.	15 hours

IV.	<p>Nucleic Acid : Basic idea of structure of DNA & RNA Functions of DNA and RNA</p> <p>Water and Electrolyte, Fluid compartment, daily intake and output sodium and potassium balance</p>	5 hours
V.	<p>Hormones: Actions of Hormone Insulin, Glucagon, Thyroid and Parathyroid hormones, Cortical hormones.</p> <p>Biophysics: Concepts of pH and buffers, osmotic pressure and its physiological applications. Acid Base Balance , role of lungs and kidneys,– Regulation of blood pH, acidosis, Alkalosis</p> <p>Physical Chemistry: Osmosis, Dialysis, Donann membrane equilibrium</p>	5 hours
Total		45 hours

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.
3. Jeremy, M. B., Stryer, L., Tymoczko, J., Gatto, G. (2019). Biochemistry, 9th Edition, New Delhi: WH Freeman publishers.
4. Satyanarayan, U., Chakrapani, U. (2017). Biochemistry, 5th Edition; Elsevier India.
5. Rama, Rao. (2017). Textbook of Biochemistry, 10th Edition; UBS Publishers\ Distributors Pvt. Ltd.
6. Deb, A. C. (2001), Fundamentals of Biochemistry, 9th Edition; New Central Book Agency (p) Ltd
7. Conn, E.E., Stumpf, K.P., George B. (2006). Outlines of Biochemistry, 5th Edition; Wiley publishers.
8. Gupta, R.C and Bhargava, S. Practical Biochemistry, 5th Edition; New Delhi: CBS publishers and distributors.
9. Plummer, David T. (2010). Introduction of Practical Biochemistry, 3rd Edition; Tata McGraw-Hill Education Pvt. Ltd.

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.

Paper IV/Subject Name: HDPC - Hospital Duty and Patient Care - I (**Theory**)

L-T-P-C – 3-1-0-4

Scheme of Evaluation: (T/P/TP)

Objective : This syllabus has been formulated to impart basics knowledge on Hospitals, First Aid, Record keeping and report writing, Basic care, comfort, sign and symptoms and hygiene of patients.

Course outcome : Upon successful completion of this course, students will be able to:

1. Understanding the principles and functions of hospital management.
2. Understanding the concept of writing good reports and records.
3. To give appropriate 1st aid in various situations.
4. Understanding the concept of maintaining personal and hospital hygiene.
5. To give basic care comfort and support to patient in hospital
6. Understanding the basic concept of vital signs of the body.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
I.	Hospitals - types and administration Structural organisation of the Radiology department Records and reports Hospital Management and Human Resource Ethical codes	10 hours
II.	Quality Management Biomedical waste management Basic care needs Laboratory safety	5 hours
III.	Vital signs	10 hours
IV	Communication Care of patient Patient rights and responsibilities Negligence Comfort positions for patient	10 hours
TOTAL		35 hours

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.

III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

SECOND SEMESTER

Bachelor Degree in Radiology Imaging Technology (BRIT)

2nd Semester							
Sl.No	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C201	Human Anatomy - II	3	1	0	4	4
2	RIT242C202	Physiology - II	3	1	0	4	4
3	RIT242C203	Biochemistry - II	3	1	0	4	4
4	RIT242C204	Hospital Duty and Patient Care-II	3	1	0	4	4

5	RIT242C211	Human Anatomy Practical	0	0	4	2	4
6	RIT242C212	Physiology-Practical	0	0	4	2	4
7	RIT242C213	Biochemistry Practical	0	0	2	1	4
Ability Enhancement Compulsory Courses (AECC)							
8	CEN982A101	Communicative English I	1	0	0	1	1
9	BHS982A104	Behavioural Science-I	1	0	0	1	1
Generic Elective							
10	RIR242G201	GE-I : Pharmacology	2	0	2	3	4
		TOTAL	19	4	8	30	37

SYLLABUS (2nd Semester)

Paper IV/Subject Name: HUMAN ANATOMY - II
L-T-P-C – 2-0-2-3

Scheme of Evaluation: (T/P/TP)

Objective: This subject is designed to impart fundamental knowledge on the structure and functions 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 pharmacy.

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

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
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I.	<p>Respiratory system: Parts of Respiratory system; Structure of nose, nasal cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments.</p>	10 hr
II.	<p>Urinary System: Parts of Urinary system, location and gross structure of kidney, ureter, urinary bladder, urethra.</p>	5 hr
III	<p>Reproductive system:</p> <ul style="list-style-type: none"> • Parts of male reproductive system, gross structure of testis, vas deferens, epididymis, prostate. • Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland. 	5 hr
IV	<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 	15 hr
V	<p>Endocrine glands: Name of all endocrine glands, gross structure & functions of pituitary gland, adrenal gland, thyroid gland and parathyroid gland.</p>	5 hr
VI	<p>Sensory Organs:</p> <ul style="list-style-type: none"> • Skin & its appendages. • Structure of eye & lacrimal apparatus, name of extraocular muscles. • Structure of ear: external, middle & inner ear. 	5 hr
TOTAL		45 hours

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.
3. Tandon, O.P., Tripathi, R. (2011). Best and Taylor's Physiological basis of Medical Practice, 13th Edition, USA: Williams & Wilkins
4. Arthur, C. Guyton., Hall, E. J. (2011). Text book of Medical Physiology, 12th Edition, USA: Elseviers.
5. Grabowski, T., Palmetto, G. A. (2014). Principles of Anatomy and Physiology, 14th Edition, USA: Wiley inter-science.
6. Singh, I. (2011). Textbook of Human Histology, 6th Edition, New Delhi: Jaypee brother's medical publishers.

7. Ghai, C.L.(2013). Textbook of Practical Physiology, 8th Edition, New Delhi: Jaypee brother's medical publishers.

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.
3. Chatterrje, C. C. (2017). Human Physiology. 11th Edition. Kolkata: Academic Publishers.

Teaching Learning Process and Assessment Methods

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Students will be able to explain the gross morphology, structure and functions of various organs of the human body.	Traditional chalk and board teaching and presentations ,hands-on- Microscopic study of epithelial and connective tissue, muscular and nervous tissue.	Unit assessment by multiple choice questions (MCQ), internal assessments, regular question answer session.
II.	Describe the various homeostatic mechanisms and their imbalances.	Traditional chalk and board teaching, power point presentations, laboratory based identification	MCQs, regular discussions Test on structure and functions of the organ system
III	Students will be able to explain the gross morphology, structure and functions of various organs of the human body.	Traditional teaching and regular discussions and power point presentation on blood and other body fluids	Test and MCQ , assignments.
I V	Students will be able to identify the various tissues and organs of different systems of human body and appreciate coordinated working pattern of different organs of each system	Class conduction using board and power point presentation.	Test and MCQ , assignments.

Objective: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

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

1. Understand the principles of volumetric and electro chemical analysis
2. Carryout various volumetric and electrochemical titrations
3. Develop analytical skills
4. Understand the principle and applications of different electrochemical methods of analysis.

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p style="text-align: center;"><i>Respiratory System</i></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. - Transport of Carbon-Dioxide- Forms of transportation. - Hypoxia-Definition, types, effects of hypoxia. - Cyanosis-Definition and types. - Artificial Respiration- CPR 	10 hours
II.	<p style="text-align: center;"><i>Excretory System</i></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 Bladder-its innervation, micturition reflex 	5 hours

	<p style="text-align: center;"><i>Endocrine System</i></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
III.	<p style="text-align: center;"><i>Reproductive System</i></p> <ul style="list-style-type: none"> - Male Reproductive System-Stages of spermatogenesis, function of Testosterone - Female Reproductive System-Ovulation, menstrual cycle, functions of Estrogen and progesterone 	5 hours
IV	<p style="text-align: center;"><i>Central Nervous System</i></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 - Ascending and Descending tracts- names and functions - 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 mechanism of hearing 	15 hours
TOTAL		45 hours

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.
3. Tandon, O.P., Tripathi, R. (2011). Best and Tailor's Physiological basis of Medical Practice, 13th Edition, USA: Williams & Wilkins
4. Arthur, C. Guyton., Hall, E. J. (2011). Text book of Medical Physiology, 12th Edition, USA: Elseviers.
5. Grabowski, T., Palmetto, G. A. (2014). Principles of Anatomy and Physiology, 14th Edition, USA: Wiley inter-science.
6. Singh, I. (2011). Textbook of Human Histology, 6th Edition, New Delhi: Jaypee brother's medical publishers.
7. Ghai, C.L.(2013). Textbook of Practical Physiology, 8th Edition, New Delhi: Jaypee brother's medical publishers.

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.
3. Chatterjee, C. C. (2017). Human Physiology. 11th Edition. Kolkata: Academic Publishers.

Teaching learning process and assessment

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Understand the physiology of blood, CVS and GI system	Traditional chalk and board teaching and power point presentations, discussions	Unit assessment by multiple choice questions (MCQ), internal assessments etc.
II.	Understand the physiology of Respiratory and Endocrine system	Traditional chalk and board teaching, power point presentations, laboratory tests	MCQs, regular discussions Tests
III	Students will able to understand the physiology of CNS, ANS and Excretory system	Traditional teaching and regular discussions and power point presentations and laboratory tests	Test and MCQ , assignments.
IV	Understand the physiology of Reproductive system, Nerve muscle.	Class conduction using board and power point presentation, laboratory tests	Regular class Tests and quizzes and assignments.

Paper III/Subject Name: Biochemistry (Theory)

L-T-P-C – 3-0-2-4

Scheme of Evaluation: (T/P/TP)

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

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

1. Know the basic biochemistry of carbohydrates, lipids and proteins

2. Understand the basics of electrolytes and their importance
3. Understand the basics of biophysics
4. Preparation of physical chemistry and organ function tests

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> • Lipids <ul style="list-style-type: none"> – Definition and classification of lipids – Classification of Fatty acid – Examples and functions of common lipid (phospholipids, glycolipids, steroids) – Lipid Metabolism – β oxidation of fatty acid – Ketone bodies – Ketosis and ketoacidosis 	15 hours
II.	<ul style="list-style-type: none"> • Vitamins <ul style="list-style-type: none"> – Definition and classification according to solubility – Source and function of individual vitamins – Deficiency 	10 hours
III.	<ul style="list-style-type: none"> • Minerals <ul style="list-style-type: none"> – Individual minerals – calcium, phosphorus, iron, magnesium fluoride, copper, selenium, molybdenum etc. - their sources, function and properties. 	5 hours
IV.	Enzymes <ul style="list-style-type: none"> – Definition and classification of enzyme – Basic idea of co-enzyme, iso-enzyme – Mechanism of enzyme action – Factors affecting enzyme action. 	10 hours

V.	<ul style="list-style-type: none"> • Clinical Biochemistry <ul style="list-style-type: none"> – Liver function test – Renal function test 	5 hours
Total		45 hours

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.
3. Jeremy, M. B., Stryer, L., Tymoczko, J., Gatto, G. (2019). Biochemistry, 9th Edition, New Delhi:WH Freeman publishers.
4. Satyanarayan, U., Chakrapani, U. (2017). Biochemistry, 5th Edition; Elsevier India.
5. Rama, Rao. (2017). Textbook of Biochemistry, 10th Edition; UBS Publishers\ Distributors Pvt. Ltd.
6. Deb, A. C. (2001), Fundamentals of Biochemistry, 9th Edition; New Central Book Agency (p) Ltd
7. Conn, E.E., Stumpf, K.P., George B. (2006). Outlines of Biochemistry, 5th Edition; Wiley publishers.
8. Gupta, R.C and Bhargava, S. Practical Biochemistry, 5th Edition; New Delhi: CBS publishers and distributors.
9. Plummer, David T. (2010). Introduction of Practical Biochemistry, 3rd Edition; Tata McGraw-Hill Education Pvt. Ltd.

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

Teaching Learning Process and Assessment Methods

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.

II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name: HDPC - Hospital Duty and Patient Care - II (Theory)

L-T-P-C – 2-0-2-3

Scheme of Evaluation: (T/P/TP)

Objective : This syllabus has been formulated to impart basics knowledge on Hospitals, First Aid, Record keeping and report writing, Basic care, comfort, sign and symptoms and hygiene of patients.

Course outcome : Upon successful completion of this course, students will be able to:

1. Understanding the principles and functions of hospital management.
2. Understanding the concept of writing good reports and records.
3. To give appropriate 1st aid in various situations.
4. Understanding the concept of maintaining personal and hospital hygiene.
5. To give basic care comfort and support to patient in hospital
6. Understanding the basic concept of vital signs of the body.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
I.	First aid Artificial respiration - CPR Hygiene Bleeding control	10 hours

II.	Drugs Methods of drug administration Injection techniques	5 hours
III.	Shock Burn Poisoning Syncope Choking HAI	10 hours
IV	International Organisation for standardisation Regulatory Authority for Nuclear and Radiation facilities Environmental impact of radiation Radiation hazard and radiation safety Handling of patient during radiological examination	10 hours
TOTAL		35 hours

Textbook : 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.
3. Jeremy, M. B., Stryer, L., Tymoczko, J., Gatto, G. (2019). Biochemistry, 9th Edition, New Delhi:WH Freeman publishers.
4. Satyanarayan, U., Chakrapani, U. (2017). Biochemistry, 5th Edition; Elsevier India.
5. Rama, Rao. (2017). Textbook of Biochemistry, 10th Edition; UBS Publishers\ Distributors Pvt. Ltd.
6. Deb, A. C. (2001), Fundamentals of Biochemistry, 9th Edition; New Central Book Agency (p) Ltd
7. Conn, E.E., Stumpf, K.P., George B. (2006). Outlines of Biochemistry, 5th Edition; Wiley publishers.
8. Gupta, R.C and Bhargava, S. Practical Biochemistry, 5th Edition; New Delhi: CBS publishers and distributors.
9. Plummer, David T. (2010). Introduction of Practical Biochemistry, 3rd Edition; Tata McGraw-Hill Education Pvt. Ltd.

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.

Teaching Learning Process and Assessment Methods

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
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I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

3rd SEMESTER**Bachelor Degree in Radiology Imaging Technology (BRIT)**

3 rd Semester (Part II)							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C301	Basic Physics	3	1	0	4	4
2	RIT242C302	Microbiology	3	1	0	4	4
3	RIT242C303	Physics of Radiology	3	1	0	4	4
4	RIT242C311	Basic Physics Practical	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A301	Communicative English III	1	0	0	1	1
6	EVS982A303	Environmental Science	2	0	0	2	2
Ability Enhancement Elective Courses (AEEC)							
7		AEEC-I	2	0	0	2	2
Generic Elective							
8	RIT242G301	GE-V	3	0	0	3	3
9	RIT242G302	GE-VI	3	0	0	3	3
		TOTAL	20	3	4	25	27

Paper IV/Subject Name: Basic Physics**L-T-P-C – 3-1-0-4****Scheme of Evaluation: (T/P/TP)**

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.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
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 & Kirchoff's 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. • Thermionic emission, the vacuum diode, variation of anode current with anode voltage and filament temperature in the vacuum diode, the effect of gas in the diode, the thermionic gas diode. 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, shock-proofing. 	15 hours
II.	<p>X-rays :</p> <ul style="list-style-type: none"> • 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. 	5 hours
III.	<p>Mains Supply :</p> <ul style="list-style-type: none"> • 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. 	5 hours

IV	Diagnostic High Tension Circuits : <ul style="list-style-type: none"> Self rectified, half-wave, full-wave, 4 rectifier, 3 phase, capacitor discharge, constant potential. main voltage compensation, mains resistance compensation, compensations for mains frequency variation. Control of tube voltage, kilovoltage compensation; filament circuit, control of tube current, space charge compensation. High tension (tube selector) switch. meters- function; use of shunts. Meters Commonly Found In Diagnostic X-Ray Equipment, Position In Circuits, Reading Meters. 	10 hours
TOTAL		35 hours

Text Book:

1. Basic Medical Radiation physics – Stanton
 Publisher-McGraw-Hill Inc.,US

Reference Books:

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

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.

III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name: Microbiology

L-T-P-C – 3-1-0-4

Scheme of Evaluation: (T/P/TP)

Objective : This syllabus has been formulated to impart basics knowledge on Hospitals, First Aid, Record keeping and report writing, Basic care, comfort, sign and symptoms and hygiene of patients

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
I.	<ul style="list-style-type: none"> • History of Microbiology - • Use of microscope in the study of bacteria – • Types of microscopes - compound microscope, • Phase contrast microscope • Electron microscope, fluorescent microscope • dark ground microscope. • Morphology of bacterial cell 	10 hours
II.	<ul style="list-style-type: none"> • Safety measures in laboratory • Sterilization and Disinfection: Physical Methods of Sterilization, Chemical Methods of Sterilization, Methods of Disinfection • Normal microbial flora of human body, role of normal flora • Biomedical waste management 	10 hours

III.	Introduction and morphological features of <ul style="list-style-type: none"> • Bacteria, • Fungi • Viruses • Parasites • Microbial pathogenicity 	10 hours
IV	<ul style="list-style-type: none"> • Brief Introduction of morphology • diseases associated with of Streptococcus pneumoniae, • Mycobacterium • Aspergillus • Tinea • Mycetoma • Cryptococcus. 	15 hours
TOTAL		45 hours

Text Book:

1. Essentials of Medical Microbiology Jaypee Brothers Medical Publishers; Third edition

Reference Books:

2. Essentials of Microbiology -Elsevier India

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.

II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name: Physics of Radiology

L-T-P-C – 3-1-0-4

Scheme of Evaluation: (T/P/TP)

Objective : This course has been formulated to impart basic knowledge of physics and its related principle and theories.

Course outcome : Students will be able to understand basic principle of physics and electricity and will be able to make simple electric circuits.

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 • Interaction of x-ray with matter • Attenuation 	10 hours

II.	<ul style="list-style-type: none"> • X-Ray Tubes • Construction of various x-ray tube & handling • Filament design • 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 	20 hours
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 	5 hours
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 and properties of X-Rays. • Physics of X-ray spectra - characteristics and brehmstrahlung x-rays • Factors upon which x-ray emission depends, soft and hard x-rays • Coherent scattering- Thomson scattering, Rayleigh Scattering, Photoelectric absorption, pair production, photo disintegration 	15 hours
TOTAL		45 hours

Text Book:

1. Textbook of radiology Physics, Hariqbal singh, Roshan Lodha jaypee publishers
2. Fundamental Physics of Radiology (Varghese Publishing House) by Meredith W.J. & Massey J B
3. 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. Radiation physics for Nuclear Medicine edited by Marie Clarie, Christoph Hoeschen, Springer.

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Bachelor Degree in Radiology Imaging Technology (BRIT)

4th SEMESTER

4 th Semester							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C401	Radiographic Technique – I	3	1	0	4	4
2	RIT242C402	Basics of Pathology	3	1	0	4	4
3	RIT242C411	Radiographic Technique – I Practical	0	0	4	2	4
4	RIT242C412	Clinical Training – Practical	0	0	8	4	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A401	Communicative English IV	1	0	0	1	1
Ability Enhancement Elective Courses (AEEC)							
6		AEEC-II	2	0	0	2	2
Generic Elective							
7	RIT242G401	GE-VII	3	0	0	3	3
		TOTAL	15	2	12	23	25

Paper IV/Subject Name : Radiographic Technique - I Theory

L-T-P-C – 3-1-0-4

Objective : This course has been formulated to develop knowledge on radiographic projection commonly encounter in clinical environment

Course outcome : Students will be able to understand how to approach radiographic positioning and technique effectively and also understand the importance of achieving best possible image with minimum exposure.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p>Principles of Radiography :</p> <ul style="list-style-type: none"> • Preparation of The Room, Apparatus and Instruments • Positions of The Patient: Erect, Sitting, Supine, Prone Lateral, Oblique, Decubitus etc. • Relative Position of X-Ray Tube and Patient, Relevant Exposure Factors Use of Accessories Such As Radiographic Cones, Grid and Positioning Aids. • Anatomic and Physiological Basis of the Procedure, Association With Theory With Practical Work • Radiographic Appearances, Both Normal and Common Abnormal Conditions Where Elementary Knowledge of The Pathology Involved Will Ensure The Application of the Appropriate Radiographic Technique. • Modifications In Technique For Various Disabilities and Types of Subject. Radiation Protection, Use of Gonad Shield, Practical Methods Reducing Radiation Dose to the Patient. 	10 hours
II.	<p>Upper-limb:</p> <ul style="list-style-type: none"> • 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>Lowerlimb:</p> <ul style="list-style-type: none"> • 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. 	10 hours

<p style="text-align: center;">III.</p>	<p>Pectoral Girdle and Thorax:</p> <ul style="list-style-type: none"> • 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. <p>Pelvic Girdle and Hip Region:</p> <ul style="list-style-type: none"> • 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. 	<p style="text-align: center;">10 hours</p>
<p style="text-align: center;">IV</p>	<p>Vertebral Column:</p> <ul style="list-style-type: none"> • Routine Projections For The Greater Occipital Joint, Cervical Spine, Cervico Thoracic Junction, Thoracic Spine, Lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx. • Supplementary Projections For The Intervertebral Foramina, Posterior Arch of Atlas, Flexion and Extension of Cervical Spine, Scoliosis, and Kyphosis, Sacro Ileac Joint. 	
	<p>Chest:</p> <ul style="list-style-type: none"> • Routine Projections For Lungs, Cardia and Diaphragm. • Supplementantary Projections For Opaque Swallow, Thoracic Inlet, Soft Tissue Neck, Decubitus, Apicugrams, Paediatric Cases. <p>Abdomen:</p> <ul style="list-style-type: none"> • Kub, Erect Abdomen and Decubitus Projection, Supplementary Projeaions For Acute Abdomen. 	

	<p>Skull:</p> <ul style="list-style-type: none"> • 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. <p>Nasal Sinuses:</p> <ul style="list-style-type: none"> • Techniques For Frontal, Maxillary, Ethmoidal and Sphenoid Sinuses, Erect and Horizontal Projections For Fluid Levels. <p>Teeth:</p> <ul style="list-style-type: none"> • 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. 	
V	<p>CR and DR :</p> <ul style="list-style-type: none"> • Application of CR, its instrumentations, DRY and Laser printer, CR Printer's application. • DICOM, Application, Functions, Features and its advantages. • Automatic processor, Application, principal. Working technique, work load handling in automatic processor. • Radiological Information Systems 	15 hours
TOTAL		45 hours

Textbook :

1. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy., 8th edition, Elsevier Health Sciences
2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012
3. Pocketbook of radiographic positioning, Ruth Sutherland, Calum Thomson, 3rd edition, Elsevier Health Sciences

1. **Reference book :** Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures, 4th edition,. Elsevier Health Sciences

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name : Basics of Pathology

L-T-P-C – 3-1-0-4

Objective : This syllabus has been formulated to impart basics knowledge on cell and tissue abnormalities and associated diseases and various terminologies of diseases, basic understanding of diseases and their pathogenesis

Course outcome : Students will learn basics of pathology like cells and tissues, their structures and abnormalities like inflammation, injury, neoplasia, haemostasis

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> <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> <p>1. Technical considerations</p> <p>2. Patient consideration</p>	15 hours
II.	<p>Classifications (Definitions, Examples, Sites, Complications, Prognosis)</p> <p>A. Mechanics</p> <p>B. Chemicals</p> <p>C. Thermals</p> <p>D. Radiation</p>	5 hours

III.	<p>Causes of Diseases (Process, Examples)</p> <p>A. Pathological</p> <p>B. Traumatic</p> <p>C. Surgical</p> <p>D. Healing process</p> <p>E. Complications</p> <p>F. Genetics (caused by or contribution by genetic factors) vs. heredity</p>	5 hours
IV	<p>Radiologic pathology (definitions, Etiology, Examples, Sites, Complications, prognosis, Radiographic Appearance , procedural and Technical considerations, appropriate imaging modality)</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>	15 hours
TOTAL		35 hours

Textbook :

1. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
2. General and Systemic Pathology, James underwood, Simon Cross, 5th edition, Elsevier

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
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I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Bachelor Degree in Radiology Imaging Technology (BRIT)

5th SEMESTER

5 th semester (Part III)							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C501	Medical Radiation Physics	3	1	0	4	4
2	RIT242C502	Radiographic Technique - II	3	1	0	4	4
3	RIT242C503	Darkroom Technique	2	0	0	2	2
4	RIT242C514	Clinical Training – Practical	0	0	8	4	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A501	Communicative English-V	1	-	-	1	1
DSE Subjects (Choose any two)							
6	RIT242D501	Biomedical Instrumentation Techniques	3	0	0	3	3
7	RIT242D502	Forensic histopathology	3	0	0	3	3
8	RIT242D503	Advances in histopathological techniques	3	0	0	3	3
9	RIT242D504	Virology and Parasitology	3	0	0	3	3
		TOTAL	14	2	8	21	21

Paper IV/Subject Name : Medical Radiation Physics

L-T-P-C – 3-1-0-4

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

Course outcome : Students will have knowledge of fundamentals in radiations, basic principle of radiation physics in relation to radiotherapy

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p>Principles of Radiation Detection and Measurement:</p> <ul style="list-style-type: none"> Gas-filled detectors (ion chambers, proportional counters and geiger muller counters) scintillation detectors, thermoluminescent dosimeters(tid). Reasons for choice of airionization. roentgen and rad. simple principles of dosimeters. 	10 hours
II.	<p>Biological Effects of Radiation:</p> <ul style="list-style-type: none"> Chemical Effects of Radiation-Radiolysis of Water ; Production of Free Radicals, Radicals Reactions, G-Value. Effects non stochastic effects, chromosome aberrations and mutations. radiation effects on whole body (early effects and late effects). Concept of Doubling Dose. Risk Factors 	5 hours
	<p>Radiation Protection:</p> <ul style="list-style-type: none"> Philosophy of radiation protection- historical development, maximum permissible exposure concept; annual dose equivalent limits (adel) alara concept; international recommendations and current code of practice for the protection of persons against ionizing radiation's from medical and dental use. 	5 hours
	<p>Control of Scattered Radiations:</p> <ul style="list-style-type: none"> Cones, Tube Diaphragms, Single and Multileaf Grids, Structure and Materials; Grid Ratio and Lines/Cm. Parallel and Focussed Grids, Stationary Grids, Crossed Hatched Grids. Gridded Cassettes, Grid Movements, Potter-Bucky Diaphragms; Single Stroke, Reciprocating and Oscillating Mechanisms; Beam Centring Devices-Centre Finders, Optical Centering Devices, Light Beam Collimators. 	10 hours

	<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. 	5 hours
III.	<p>Protective Materials:</p> <ul style="list-style-type: none"> • Lead, lead-impregnated substances, building materials, concept of barriers, lead equivalents and variations with quality. design of x-ray tubes related to protection, structural shielding design (work-load, use factor, occupancy factor, distance) departmental protection. Radiation protection of staff members patients and public. Protection instruments & personnel and area monitoring. 	5 hours
TOTAL		40 hours

Reference book :

- Christensen, Curry and Dowdey: An Introduction of The Physics of Diagnostic Radiology (Lea Fiebiger)
- D.N and M.O. Chesney, X-Ray Equipment For student Radiographers (Cbs) W.J. Meredith & J.B. Massey: Fundamental Physics of Radiology. (Varghese Publishing House)
- Faiz M.Khan, Physics of Radiation Therapy (Williams & Wilkins)
- S.S. Kapoor & Ramamoorthy; Nuclear Radiation Detectors.

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
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I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name : Radiographic Technique - II

L-T-P-C – 3-1-0-4

Objective : This course has been formulated to develop knowledge on radiographic projection commonly encounter in clinical environment

Course outcome : Students will be able to understand how to approach radiographic positioning and technique effectively and also understand the importance of achieving best possible image with minimum exposure.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
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<p>I.</p>	<ul style="list-style-type: none"> • Responsibility of Radiographer During Radiological Procedures • Preparation of Patient For Different Procedures • Contrast Media- Positive and Negative, Ionic & Non-Ionic • Adverse Reactions To Contrast Media and Patient Management • Emergency Drugs In The Radiology Department • Emergency Equipments In The Radiology Department • Asepsis • Radiation Protection- Ten Day Rule 	<p>10 hours</p>
<p>II.</p>	<p>Gastro- Intestinal Tract:</p> <ul style="list-style-type: none"> • Barium Swallow- Tracheo- Oesophageal Fistula • Barium Meal- Single Contrast and Double Contrast • Hypotonic Duodenography • Barium Meal Follow Through • Small Bowel Enema • Barium Enema- Gastrograffin Enema, For Reducing Intussuception Loopogram • Additional Investigation- Computed Tomography, Radio Isotope Scanning <p>Biliary Tract</p> <ul style="list-style-type: none"> • Oral Cholecystography • Intravenous Choledochography • Pre Operative Choledochography- Percutaneous Extraction of Retained Biliary Calculi • Percutaneous Transhepatic Choledochography- Biliary Drainage • Endoscopic Retrograde Choledochopancreatography 	<p>10 hours</p>

	Urinary System: <ul style="list-style-type: none"> • Excretion Urography • Percutaneous Renal Puncture • Percutaneous Nephrolithotomy • Lithotripsy • Reterograde Pyeloureterography • MIcturating Cysto Urethrography- Urodynamic Investigations • Ascending Urethrography • Additional Investigation: Ultrasound Scanning • Radio- Isotope Scanning • Computed Tomography • Magneticresonance and Imaging 	10 hours
III.	Reproductive System: <ul style="list-style-type: none"> • Hystero Salpingogram • Gynaecography • Pelvimetry • Vesiculography 	5 hours
TOTAL		35 hours

Reference book :

- V.R Narayana, Sharma Strengthen Your Writing
- Orient Longma, New Delhi
- Piles :Medical Radiographic Techniques (Thomas)
- Santel. R. : Roentgenologic Techinique (Thomas)
- Philip Wballiger : Merils atlas of radiographic positions and radiological procedures (mosby)
- Goldmen: A Radiogrpahic Index
- Patesson : Printed Notes For Radiographers In India (Cmai)
- Achwaz : Unit Step Radiography (Thomas)
- Ross & Galloway: A Hand Book of Radigraphy (Lewis)
- Glenda J. Bryan: Diagnostic Radiography (Churchill Livingstone)
- Jacobi & Paris Textbook of Radiological Technology (Mosby)
- Scarrow : Contrast Radiography (Schering Chemicals)
- Vanderplasts : Medical X-Ray Technique (Mac Millan)

- Stephen Chapman & Richare Nakielny: A Guide To Radiological Procedures (Jaypee Brothers)

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name : Darkroom Technique

L-T-P-C – 3-1-0-4

Objective : This subject is designed to impart fundamental knowledge on the construction and the importance of a darkroom in a Radiology department. Students will also learn about the technique of processing and developing an x-ray film, the different types of films and chemicals used and the physics behind the formation of an x-ray image.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
I.	<p>Darkroom Planning and Installation :</p> <ul style="list-style-type: none"> • For a Small Hospital, For a Large Hospital • Location of Dark Room • Construction of Dark Room • Ventilation • Wall Protection • Entrance To Dark Room- Single Door, Double Door, Labyrinth 	5 hours
II.	<p>Equipments :</p> <ul style="list-style-type: none"> • Loading and unloading of X-ray Films, Technique, Safety concern, Handling in loading and unloading films • Developer, fixer content. Developing technique, Fixing technique <p>Photochemistry :</p> <ul style="list-style-type: none"> • Chemistry of Image Formation • Fomation of Latent Image • Conversion of Latent Image To Visible Image • Meaning of Ph • Importance of Ph in Processing <p>Film Faults:</p> <ul style="list-style-type: none"> • Fog- Various Fogging In Films, Causes and Prevention. Stains- Types, Causes and Prevention Spots and Splashes- Types, Causes and Prevention Marks and Prints- Types, Causes and Prevention Drying Marks- Types, Causes and Prevention Faults In Automatic Processor- Types, Causes. • Safe light test • Safe light principal, benefits and its location • Cleaning & maintenance of Cassette, Safe and hygienic handling of cassettes and maintenance • Light leakage test in Cassettes • Cassettes safety and image quality features • Handling and storage of X-ray Film & Film Boxes, Handling of X-ray films, easy to achieve locations, safe places of storage. • Using techniques of films by size of open boxes • 	15 hours

	Processing Methods: <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. 	
III.	X-Ray Cassette: <ul style="list-style-type: none"> • Construction of X-Ray Cassettes • Types of Cassettes • Intensifying Screens In Cassettes • Identification of Cassettes • Care of Cassettes 	5 hours
TOTAL		35 hours

Text Book:

1. D.N. Chesney & M.O. Chesney: Radiographic Imaging (Cbs)

Reference Books:

1. I.C.R.P.: Protection of The Patient In Medical Radiography (Bergaman)
2. Derrick P, Roberts & Nigel L. Smith: Radiographic Imaging A Practical Approach (Churchill Livingstone)

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.

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Bachelor Degree in Radiology Imaging Technology (BRIT)

6th SEMESTER

6 th semester							
Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	RIT242C601	Diagnostic Imaging Technique - I	3	1	0	4	4
2	RIT242C602	Diagnostic Imaging Technique - II	3	1	0	4	4
3	RIT242C603	Radiotherapy and Emergency Medicine	3	1	0	4	4
4	RIT242C614	Clinical Training – Practical	0	0	8	4	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A601	Communicative English-VI	1	-	-	1	1
DSE Subjects (Choose any two)							
6	RIT242D601	Quality Control, Radiobiology & Radiation Safety in Radiodiagnosis / Imaging	3	0	0	3	3
7	RIT242C602	Radiation Hazards, Control & Safety	3	0	0	3	3
8	RIT242C603	Recent Advances In Diagnostic Imaging	3	0	0	3	3
		TOTAL	16	3	8	23	23

Paper IV/Subject Name : Diagnostic Imaging Technique - I

L-T-P-C – 3-1-0-4

Objective : This course has been formulated to develop knowledge on basic principles of ultrasound, adequate understanding on imaging techniques.

Course outcome : This curriculum can stimulate the students in sensitive management of patients, basics of ultrasound and echo positioning and projections

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
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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 • 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 	10 hours
II.	<ul style="list-style-type: none"> • Artifacts in ultrasound • Comparison of ultrasound equipment Computerization of data, Image recording, • Ultrasound jelly & Safety of ultrasound 	5 hours
III	<ul style="list-style-type: none"> • Artifacts in ultrasound • Comparison of ultrasound equipment Computerization of data, Image recording, • Ultrasound jelly & Safety of ultrasound 	5 hours
IV	<ul style="list-style-type: none"> • USG Contrast Media-Types of Ultrasound Contrast media and its advantages • Care & maintenance QA & QC & USG equipment 	5 hours
V.	<ul style="list-style-type: none"> • Echocardiography • Equipment, Introduction, indication and image formation. • Uses of colour Doppler in echocardiography and equipment description with transduce. 	5 hours
TOTAL		35 hours

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.

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
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I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
IV.	Students will gain knowledge about hormones and organ function test.	Teaching will be imparted by chalk and board method. laboratory Preparation of the product will also be conducted	Students will given assignments and tests.

Paper IV/Subject Name : Diagnostic Imaging Technique - II

L-T-P-C – 3-1-0-4

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 : This curriculum can stimulate the students in sensitive management of patients, working principle of CT, positioning and projections, processing techniques for better image quality. Students will be able to understand the working principle of MRI, radiographic positioning, planning of different scanning planes and diagnostic value

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
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<p>I.</p>	<p>Magnetic Resonance and Imaging</p> <ul style="list-style-type: none"> • History • The Spinning Proton- Magnetisation, Precession, Larmor Frequency • Radio Frequency Pulse and Proton- Resonance, Free Induction Decay, Relaxation, T-1 & T-2 Instrumentation- Magnet, Shim Coils, Gradient Coils, Radio Frequency Transmitter and Receiver Coils, Computer • Pulse Sequences- Saturation Recovery, Spin Echo, Inversion Recovery • Image Production- 2d and 3d Pictures • Image Quality- Signal To Noise Ratio, Contrast To Noise Ratio • Image Artefacts • Flow Techniques-Magnetic Resonance Angiography Spectroscopy, Mr. Contrast Agents- Paramagnetic and Ferromagnetic Documentation, Safety Consideration Quality Assurance 	<p>15 hours</p>
<p>II.</p>	<p>BMD: (Bone Mineral Densitometry)</p> <ul style="list-style-type: none"> • Test and equipment handling, patient handling 	<p>5 hours</p>

	<p>Computed Tomography</p> <ul style="list-style-type: none"> • History • Principles of Computed Tomography • Generations-Spiral C.T. • Instrumentation • Data Acquisition • Data Presentation • Image Reconstruction • 2D and 3D Images • Image Display • Pixel and Voxel • C.T. Number • Window Level and Window Width • Scan Artefacts • Patient Positioning In Computed Tomography • Contrast Materials and Administration • Basic Diagnostic Aspects • Interventional C.T. Guided Procedures • Documentation • Safety Consideration-Radiation Dose • Quality Assurance 	20 hours
TOTAL		40 hours

Reference book :

- R.F. Fatr & P.J. Ahisy: Physics For Medical Imaging (Saunders)
- D.N. Chesney & M.O. Chesney: X-Ray Equipment For Student Radiographers (Cbs)
- Christensen, Curry & Dowdey: An Introduction of Physics To Diagnostic Radiography (Lea & Febiger)
- Cullian: Illustrated Guide Techniques (Blackwell)
- Jamdrell, Thompson & Ashworth: X-Ray Physics and Equipment (Blackwell)
- Adrian K. Dixon: Body C.T.- A Handbook (Churchill Livingstone)
- John M. Stevens, Alan R. Valentine & Brian E. Kendall: Computed Cranial & Spinal Imaging (Williams & Wilkins)
- John R. Haaga. Charles F. Lanzion, David J. Sartoris & Elias A. Aerhouni. Computerised

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
II.	Understand the basics of enzymes and metabolism.	Students will be taught by using of traditional chalk board and demonstrations by showing pictures of dosage form.	Quiz will be organized. Assignment and tests.
III.	Understand the basics of electrolytes and their importance	Will be taught by chalk and board method. Students will be shown various power point presentations for concept building	They will be asked for examples from regularly used products. Assignment and tests will be conducted.
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Paper IV/Subject Name : Radiotherapy

L-T-P-C – 3-1-0-4

Objective : This course has been formulated to Impart basic knowledge of nuclear imaging and development of recent technologies in diagnosis.

Course outcome : Students will be able to understand basic principle and advances of nuclear imaging and its diagnostic value.

Detailed syllabus :

Modules	Topics (if applicable) & Course Contents	Periods
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I.	<ul style="list-style-type: none"> • Introduction of Radioactivity & its decay type • Electromagnetic spectrum • Law of radioactivity 	10 hours
II.	<ul style="list-style-type: none"> • Gamma Camera (Application, Function and instrumentation) • SPECT • Definition • Applications • Clinical uses, advantages & disadvantages 	5 hours
	<ul style="list-style-type: none"> • PET CT & PET MRI • Instrumentation of PET & its uses • Benefits vs risk • PET-CT • PET-MRI 	5 hours
III.	<ul style="list-style-type: none"> • Radionuclides • Production of radionuclide & its type • Handling of radionuclide • Characteristics and half-life of Radionuclides. • Commonly used Radionuclides • Indication, contraindications of PET Scans- Indication and contraindications of PET • Patient Preparation- Patient preparation technique in PET Scan 	10 hours
TOTAL		30 hours

Reference book :

- R.F. Fatr & P.J. Ahisy: Physics For Medical Imaging (Saunders)
- Cullinan: Illustrated Guide Techniques (Blackwell)
- John M. Stevens, Alan R. Valentine & Brian E Kendall: Computed Cranial & Spinal Imaging (Williams & Wilkins)
- John R. Haags, Charles F. Lanzion, David J. Sartoris & Elias A. Aerhouni. Computerised Tomography and Magnetic Resonance Imaging of The Whole Body (Vol 1 & II) (Saunders)
- Philip T. English & Christine Moore: Mri For Radiographers (Springer)
- Pablo R. Ros, & W. Dean Bodgood: Abdominal Magnetic Resonance Imaging (Mosby)

- Rehani: Diagnostic Imaging- Quality Assurance.

Teaching Learning Process and Assessment Methods :

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I.	Students will learn about the basic biochemistry of carbohydrates, lipids and proteins.	An appropriate blend of chalk board as well as Power point presentations will be adopted, practical demonstrations will also be given	Assignments will be Conducted along with regular tests.
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