



தமிழ்நாடு டாக்டர் எம்.ஜி.ஆர். மருத்துவப் பல்கலைக்கழகம்
The Tamilnadu Dr. M.G.R. Medical University
69, Anna Salai, Guindy, Chennai, Tamilnadu, India

Allied Health Science

B.Sc. Radiology Imaging Technology

Regulation, Curriculum and Syllabus

(2011-2012)

B.Sc in Radiology Imaging Technology

Course Guidelines & Framework

Eligibility	12 th Std School Passed and 17years of age.
Duration	3 Years
Number of Beds	50 Beds
X-Ray	300 MA X-Ray Machine –1 C-Arm X-Ray -1
CT Scan	1
Tie Up	MRI, Cath. Lab - Optional
Maximum Student Intake	10
Medical College	Medical Colleges affiliated to Tamil Nadu Dr.MGR Medical University can start this course with maximum student intake of 20.
Common Room	1
Class Rooms (25x10sq ft)	2
Multimedia	LCD projector.
Library	Minimum 100sq ft With Computers & Internet facility Minimum of 100books
Teaching Responsibility	Designated Course Director should be a Radiologist -1
Faculty	Part time Lecturers to be named- Radiologists, Neurologist, Nephrologist Ortho specialist, ENT specialist Gastroenterologist, OB&G and other Specialities.
Training Modality	
1 st Year	Theory on 1 st year subjects. + Practicals
2 nd Year	Theory on 2 nd year subjects + Practicals and Log Book.
3 rd Year	Theory on 3 rd year subjects + Practicals and Log Book
Examinations	
1 st Year	Theory Examination + Practical + Viva
2 nd Year	Theory Examination + Practical + Viva
3 rd Year	Theory Examination + Practical + Viva
Fee	
University Affiliation Fee	Rs.1lakh - one time fee.
Security Deposit	Rs.1lakh - refund as per university norms
Inspection Fee	Rs.15000
Inspection Duration	Yearly for first two consecutive year. Thereafter once in three years.
Student Registration - University Fee	Rs.500 per student.

BRIEF SUBJECT TITLE TO BE COVERED

Main Subjects		Supportive Subjects
Ist Year		
1	Human Anatomy, Physiology & Pathology relevant to Radiology.	English
2	General Physics, Radiation Physics & Physics of Diagnostic Radiology	Basics of Computer
3	Radio diagnosis Equipments, Maintenance and Quality Control.	Medical Ethics
IInd Year		
4	Clinical Radiography.	Patient Care.
5	X-ray Film / Image processing Techniques (Dark Room Techniques)	Principles of Medical Emergencies
6	Contrast & Special Radiography procedures.	
IIIrd Year		
7	Equipments of modern Imaging Modalities	
8	Modern Imaging Techniques and Recent Trends in Imaging	
9	Radiobiology & Radiation Safety	
10	Quality Control in Radiology	

NOTE: For the supportive subjects Internal Examination to be conducted by the institute conducting the course and marks should be submitted to the University.

Syllabus for B.Sc in Radiology Imaging Technology

Ist Year

Theory

- (1) **English** - Communication skills - (50hrs)
- (2) **Basics of Computer** (Computer Applications related to Radiography) - (50hrs)
- (3) **Medical Ethics** - (50hrs)
- (4) **Patient Care** - (50hrs)
- (5) **Human Anatomy** - (100hrs)

Human Anatomy, Physiology & Pathology relevant to Radiology.

Scope of Anatomy, Physiology and Pathology- Definitions and Terms in Anatomy, Physiology & Pathology- Structure and function of human cell -

Elementary tissues of human body- Brief account on Composition of Blood - functions of blood elements – Blood Group and coagulation of blood.

- Cardio Vascular System (Structure and functions of various parts of the heart, arterial and venous system, brief account on common cardiovascular disorders).
- Respiratory System (various parts of respiratory system and their functions, Physiology of Respiration).
- Digestive System (names and various parts of digestive system-Liver, Spleen, Gall Bladder, Pancreas, Buccal Cavity, Pharynx, Oesophagus, Stomach, intestine etc.-physiology of digestion and absorption)
- Urinary System (various parts of urinary system and its function-structure and function of kidneys-physiology of urine formation - pathophysiology of renal disease and edema.)
- Reproductive System (physiology and anatomy of Male & Female reproductive system-Prostate & Uterus & Ovaries etc.)
- Musculoskeletal System (Classification of bones & joints, structure of skeleton –structure of skeletal muscle – physiology of muscle contraction)
- Nervous System (various parts of nervous system- Brain and its parts – functions of nervous system - Spinal Cord & Nerves).
- Ear, Nose, Throat and Eye (Elementary knowledge of structure and functions of organs of taste, smell, hearing, vision.)
- Endocrine System (Endocrine glands ,their hormones and functions-Thyroid, Parathyroid, Suprarenal, Pituitary, pituitary and Thymus)
- Haemopoietic and Lymphatic System (Name of the blood vessels & lymph gland locations).
- Surface Anatomy & Surface Markings of Human Body.
- Outline on pathology of various systems of CVS, RS, CNS, musculoskeletal systems, GIT, GUT, Reproductive systems, pathology of radiation injury, basics in pathology of malignancies.

Practicals (75 hours)

Study of Human Skeleton parts with skeletal models..

Study with charts and models of all organ systems mentioned above.

Microscopic slides examination of elementary human tissues, cells.

(6) General Physics, Radiation Physics & Physics of Diagnostic Radiology -(100hrs)

Basic concepts of power, work, force, energy, electricity, magnetism and their units and measurements- einstein's formula – electromagnetic induction – Atomic structure – radioactivity- ionization and excitation - electromagnetic waves – X-rays production and properties – X-ray tube - quality of x-rays – factors affecting

quality and intensity of x-rays. X-ray circuits - interaction of X and gamma rays - X-radiation measurements etc.

Principles of Radiation detection and measurements – TLD, Pocket Dosimeter, Radiation Survey meter and radiation zone monitor.

Practicals - (50hrs)

Study with charts, models & power point presentations Atomic structure, X-ray tubes, X-ray circuits involving students to present and discuss.

(7) Radio diagnosis Equipments, Maintenance and Quality Control. - (100hrs)

X-ray machines – Anode & Cathode - Thermionic diode – X-ray valves and tubes – principle and practical aspects – semiconductors – triode valves – cathode ray oscilloscopes – X-ray circuits – self rectifying circuits – half wave pulsating voltage circuits – full valve pulsating voltage circuits - measurement of high voltage – control of KV circuit – mA circuit. X-ray beam quality.

C.R (principle, equipment & imaging)

Digital Radiography (principle, equipment & imaging)

Mammography (basic principle, equipment & image acquisition)

CT (Basic physics –Tomography principle - basics of plain studies, contrast studies, Special procedures)

MRI (basic principle – imaging methods - slice section- plain & contrast studies – image contrast – factors affecting image quality)

USG (Basic acoustics - ultrasound terminologies – Interaction of US with matter – Ultrasound display modes etc)

Practicals - (75hrs)

Congruance of Radiation and optical field and beam.

Determination of focal spot size of diagnostic X-ray tube.

KV and exposure time testing.

Linearity testing of the timer.

Consistency of mA loading.

Consistency of Radiation output.

Evaluation of total filtration of the tube.

Table top exposure rate measurement in fluoroscopy.

Demonstration of basic procedures with all radiographic equipments.

EXAMINATION SCHEDULES
1ST YEAR

	THEORY
PAPER-I	Human Anatomy, Physiology & Pathology relevant to Radiology.
PAPER-II	General Physics, Radiation Physics & Physics of Diagnostic Radiology.
PAPER-III	Radio diagnosis Equipments, Maintenance and Quality Control.
PRACTICALS & VIVA	
Identification of Bones	
Identification from Charts & Models on the related subject	
Identification of X-Ray equipments/ parts.	

Note: For the supportive subjects English, Basics of Computer and Medical Ethics internal tests to be conducted by the institute during the Ist year of the course and marks should be submitted to the University.

MARK SCHEDULE

SCHEME OF EXAMINATION

FIRST YEAR
(270 WORKING DAYS)

Theory Subject Title	University Theory Exam		Practical Subject Title	Practical Marks		VIVA		IA	
	Max	Min		Max	Min	Max	Min	Max	Min
Human Anatomy & Physiology relevant to Radiology.	100	50	Identification of Bones, Joints & Organs	100	50	50	25	50	25
General	100	50	Identification	100	50	50	25	50	25

Physics, Radiation Physics & Physics of Diagnostic Radiology.			from Charts & Models on the related subject						
Radio diagnosis Equipments, Maintenance and Quality Control.	100	50	Identification of parts of equipments.	100	50	50	25	50	25

Theory 100 Marks
Practical 100 Marks
Viva 50 Marks
IA 50 Marks

Internal Assessment	Marks
Theory	20
Practical	20
Log/Record work	10
Total	50

Text Books to be Read

1. Anatomy and Physiology for Radiographers- C.A. Werrick
2. Physics for Radiography - Hay and Hughs
3. Radiographic latent image processing – W. E. J Mckinney

Reference Books

1. Anatomy and Physiology for Nurses
2. Surface and Radiological Anatomy – Hamilton et al (Heffer)
3. Essentials of Human Anatomy – Russel
4. An Atlas of normal radiographic Anatomy – Ross and Wilson
5. Basic Medical Radiation physics – Stanton.
6. Christensen’s Physics of Diagnostic Radiology – Christensen.
7. Basic Radiological Physics – Thayalan
8. Physics and photography principles of Medical Radiography – Seeman and Herman.
9. Care of patient in diagnostic Radiography – Chesney & Chesney.
10. First Aid – Haugher and Gardner.
11. Practical Nursing and First Aid – Ross and Wilson.

Syllabus for BSc in Radiology Imaging Technology

IIInd Year

(4) Patient Care - (50hrs)

(5) Principles of Medical Emergencies - (50hrs)

(6) Clinical Radiography-Positioning - (200hrs)

Radiological Equipments – X-ray machine - transformers, x-ray units, fluoroscopy, grids and filters - Positional Radiography - Radiographic views of different parts of the body – Chest, Abdomen, Upper Limb, Cervical & Thoracic Spine, Lumbar Spine, Sacrum & Coccyx, Bony thorax - Sternum & Ribs, Skull and cranial bones, facial bones, paranasal sinuses, Mastoids & Temporal bones etc. Upper & Lower GIT, Gall Bladder & Biliary duct, GUT etc.

Practicals - (200hrs)

Radiographic positioning of all parts of the body.

(7) X-ray Film / Image processing Techniques (including Dark Room Techniques) - (150hrs)

X-ray Films- X-ray cassettes - Intensifying screens X-ray films types – basic film structure & quality – choosing films for different studies - basics on hard copies of radiographic images – dry & wet processing – Fixer –Developer –film processing methods - manual and automatic processing – conventional & modern image processing rooms – image processing equipments – types & maintenance – day light systems advantages & disadvantages – processing faults – glossy prints, paper prints etc – production of best quality images. Intensifying screen- Fluorescence - structure of Intensifying screens – Casette types – screen unsharpness etc.

Practicals - (50hrs)

X-ray Films- X-ray cassettes - Intensifying screens, other imaging hard copies, image processing equipments with demonstration. Film Screen contact testing.

(8) Contrast & Special Radiography procedures. - (100hrs)

Barium swallow - barium meal - barium enema (single and double contrast), Enteroclysis PTBD, Sinograms, Fistulograms, IVU, AUG, MCU, HSG, Sialogram, T-tube Cholangiogra –Fluroscopy, Image intensifiers - Tomography basics, etc

Practicals - (150hrs)

Positioning and imaging of all kinds of contrast & special radiographic procedures

EXAM SCHEDULES

IIndYear

THEORY		PRACTICALS & VIVA	
PAPER-I	Clinical Radiography-Positioning	Long Case -Demonstration of Positioning.	
PAPER-II	X-ray Film / Image processing Techniques (including Dark Room Techniques).	Developing and Dark Room Techniques.	
PAPER-III	Contrast & Special Radiography procedures.	Contrast Procedure Log Books Test Marks	

Note: For the supportive subjects Patient Care and Principles of Medical Emergencies internal tests Internal test in the subject to be conducted by the centre during IInd year of the course and marks should be sent to the University.

MARK SCHEDULE

SCHEME OF EXAMINATION

SECOND YEAR

(270 WORKING DAYS)

Theory Subject Title	University Theory Exam		Practical Subject Title	Practical Marks		VIVA		IA	
	Max	Min		Max	Min	Max	Min	Max	Min
Clinical Radiography-Positioning	100	50	Demonstration of positioning.	-	-	-	-	50	25

X-ray Film / Image processing Techniques (including Dark Room Techniques.	100	50	Developing and Dark Room Techniques.	100	50	50	25	50	25
Contrast & Special Radiography procedures.	100	50	Contrast Procedure LOG BOOK & TEST MARKS	100	50	50	25	50	25

Theory	100 Marks
Practical	100 Marks
Viva	50 Marks
IA	50 Marks

Internal Assessment	Marks
Theory	20
Practical	20
Log/Record work	10
Total	50

Question Paper Pattern

	No. of questions	Marks per question	Total Marks
Essays	3	10	30
Short Notes	10	5	50
Short Answers	10	2	20
	Total		100

Text Books to be Read

1. Radiographic latent image processing – W. E. J Mckinney
2. Radiographic Imaging - Derrick
3. Physics and photography principles of Medical Radiography – Seeman and Herman.
4. Care of patient in diagnostic Radiography – Chesney & Chesney.
5. First Aid – Haugher and Gardner.
6. Practical Nursing and First Aid – Ross and Wilson.

**Syllabus for BSc in Radiology Imaging Technology
IIIrd Year**

(9) Equipments of Modern Imaging Modalities - (100hrs)

C.R (principle, equipment & imaging)
Digital Radiography (principle, equipment & imaging)
Mammography (basic principle, equipment & image acquisition)
CT - Basic physics – Tomography principle - basics of plain studies, contrast studies, Special_Procedures. MRI -basic principle – imaging methods - slice section-plain & contrast studies –coils in use – image contrast – factors affecting image quality-
USG -Basic acoustics - ultrasound terminologies – Interaction of US with matter –
Ultrasound display modes etc.

(10) Modern Imaging Techniques and Recent Trends in Imaging - (100hrs)

Basics of Nuclear Medicine Techniques - Fusion Technology – Image guidance to therapeutic procedures-

(11) Radiobiology & Radiation Safety - (100hrs)

Biological effects of Radiation – Radiation dose–Effects of time, distance and shielding – personnel and area monitoring – Planning of X-ray rooms, dark rooms – Inspection of X-Ray installations - Registration of X-Ray equipment installation-Certification – Evaluation of workload versus radiation factors – Occupational exposure and protection Tools/devices - ICRP / AERB CT Dose Modulation-Patient dose management-

Practicals - (50hrs)

Radiation protection survey in diagnostic X-ray installations –in and around.
AERB safety requirements- Atomic Energy Act.
Radiation protection rules.

(12) Quality Control in Radiology - (50hrs)

Quality control procedure in Radiology as per NABH.- Quality assurance in Radiology -

Practicals - (50hrs)

EXAM SCHEDULES
III YEAR

	THEORY	PRACTICALS & VIVA
PAPER-I	Equipments of modern Imaging Modalities.	Demonstration of Procedure.
PAPER-II	Modern Imaging Techniques and Recent Trends in Imaging.	
PAPER-III	Radiobiology & Radiation Safety	Identification & describing Radiation safety equipments.
PAPER-IV	Quality Control in Radiology	

Note: Internal test in the subjects 'Patient Care' & 'Principles of Medical Emergencies' to be conducted by the centre during IInd year of the course and marks should be sent to University.

MARK SCHEDULE

SCHEME OF EXAMINATION
SECOND YEAR
(270 WORKING DAYS)

Theory Subject Title	University Theory Exam		Practical Subject Title	Practical Marks		VIVA		IA	
	Max	Min		Max	Min	Max	Min	Max	Min
Equipments of modern Imaging Modalities.	100	50	Demonstration of positioning.	-	-	-	-	50	25
Modern Imaging Techniques and Recent Trends in Imaging.	100	50	Procedures-Demo	100	50	50	25	50	25
Radiobiology & Radiation Safety.	100	50	Survey-Demo	100	50	50	25	50	25
Quality Control in Radiology	100	50	LOG BOOK & TEST MARKS	-	-	-	-	50	25

Theory 100 Marks
Practical 100 Marks
Viva 50 Marks
IA 50 Marks

Internal Assessment	Marks
Theory	20
Practical	20
Log/Record work	10
Total	50

Question Paper Pattern

	No. of questions	Marks per question	Total Marks
Essays	3	10	30
Short Notes	10	5	50
Short Answers	10	2	20
	Total		100

Books to be read

1. Concepts in Medical Radiographic Imaging – Marianne Tortoise
2. Radiographic Imaging - Derrick
3. Imaging Atlas of Human Anatomy – Jamie Weir et all (Mosby-Elsevier)
4. An Atlas of Normal Radiographic Anatomy – Richard and Alwin.
5. Safety aspects in Radiation – Thayalan
6. Processing and Quality Control - William
7. Quality Control in Diagnostic Imaging J.E.Gray
8. Diagnostic Imaging: Quality Assurance – M. M Rehani
9. Notes on Radiological Emergencies – Ansell and Churchill.
