



D. Y. Patil University

# SYLLABUS OF MD Radio-Diagnosis

## PREAMBLE

The purpose of this programme is to standardize Radio-diagnosis teaching at Post Graduate level throughout the country so that it will benefit in achieving uniformity in undergraduate teaching as well and resultantly creating competent radiologists with appropriate expertise.

## PROGRAMME OBJECTIVES

The objective is to train a student to become a skilled and competent radiologist to conduct and interpret various diagnostic / interventional imaging studies (both conventional and advanced imaging), to organize and conduct research and teaching activities and be well versed with medical ethics and legal aspects of imaging / intervention.

## SPECIFIC LEARNING OBJECTIVES

A resident on completing his / her MD (Radio-diagnosis) should be able to

1. Acquire good basic knowledge in the various sub-specialties of radiology such as Neuro radiology, GI-radiology, Uro-radiology, vascular-radiology, musculoskeletal, Interventional radiology, Emergency radiology, Pediatric radiology and Mammography.
2. Independently conduct and interpret all routine and special radiologic and imaging investigations.
3. Provide radiological services in acute emergency & trauma including its medico legal aspects.
4. Elicit indications, diagnostic features and limitation of applications of ultra-sonography, CT and MRI and should be able to describe proper cost-effective algorithm of various imaging techniques in a given problem setting
5. Perform various image guided interventional procedures for diagnosis and therapeutic management.
6. Undertake further specialization in any of the above mentioned branches in Radiodiagnosis such as Gastrointestinal radiology, Uro-radiology, Neuro radiology, Vascular radiology, Musculoskeletal radiology, Interventional radiology etc.
7. Formulate basic research protocols and carry out research in the field of radiology related clinical problems.
8. Work as a Senior Resident/Consultant in Radiodiagnosis and conduct the teaching programme for undergraduates, postgraduates as well as para medical and technical personnel.
9. To interact with other specialists and super-specialists so that maximum benefit accrues to the patient.
10. Organize CME in the speciality utilizing modern methods of teaching and evaluation.



11. Imparting training in both conventional radiology & modern imaging techniques so that the candidate is fully competent to practice, teach and do research in the broad discipline of radiology including Ultrasound, Computed tomography and Magnetic Resonance Imaging.

#### **Human values, Ethical practice and Communication abilities**

- Adopt ethical principles in all aspects of his/her practice. Professional honesty and integrity are to be fostered. Care is to be delivered irrespective of the social status, caste, creed or religion of the patient.
- Develop communication skills, in particular the skill to explain various options available in management and to obtain a true informed consent from the patient.
- Provide leadership and get the best out of his team in a congenial working atmosphere.
- Apply high moral and ethical standards while carrying out human or animal research.
- Be humble and accept the limitations in his knowledge and skill and to ask for help from colleagues when needed.
- Respect patient's rights and privileges including patients right to information and right to seek a second opinion.

#### **Course contents:**

##### **1) Basic Sciences**

(Radiation Physics and Radiobiology), Newer imaging techniques, Radiological anatomy, Physiology, Pathology and Radiography.

Includes fundamentals in Electricity and Electromagnetic induction, Ammeter, Voltmeter and galvanometer. Transformers, Rectifiers, Rectification, Timers, X-ray production and other aspects of X-rays. Electromagnetic Radiation, Units of Radiation interaction. X-ray film intensifying screens and other X-ray appliances, dark room procedures etc. II TV and cline flurography, Tomography Radioactive Isotopes and uses, Instrumentation in Nuclear Medicine, MMR, Radiation production and other aspects of production. Radiological Anatomy, Physiology and Pathology of different system of the body and Radiographic Techniques concerned to each system. Physics of Ultrasound, CT, MRI. Basics of Radiotherapy and equipments of radiotherapy.

##### **2) Respiratory system**

Includes the following methods of investigations and interpretation of chest films, chest wall, diaphragm, pleural disease and air way disease, pulmonary vasculature, pulmonary infections, pulmonary neoplasms, diffuse lung disease, mediastinal disease, chest trauma, post operative lung and intensive care.



Investigations like plain radiograph, ultrasound, CT, MRI, X-ray angiography and scintigraphy.

**3) Alimentary and Hepatobiliary system;**

Congenital Anomalies of GI Tract, Diseases and disorders of mouth, Pharynx, esophagus, stomach, small intestine, large intestine, diseases of omentum and mesentery, acute abdomen, abdominal trauma, newer methods like Isotope studies, CT, MRI of the Hepatobiliary system. Diseases and disorders, newer methods of imaging Hepatobiliary & pancreatic system like Isotope studies, Ultrasonography, Arteriography, spiral CT, MRI.

**4) Head and neck; spinal column and skull**

Includes Radiological imaging of various diseases and disorders of the above system. Investigative procedures of congenital lesions, vascular lesions, infective lesions, metabolic lesions, traumatic lesions and neoplasia of the central nervous system including CT, MRI, Arteriography & plain films. Disease and disorders of spinal cord lesions including congenital lesions. Interventional procedures.

**5) Cardiovascular system**

Role of Radiological imaging by different techniques including DSA and interventional procedures. Diseases and disorders of Cardiovascular system including Congenital conditions and the role of imaging by conventional , Ultrasound, Echo, Doppler, CT, MRI, Angio, DSA and Radio Nuclide studies.

**6) Endocrinal system**

Imaging of disorders and congenital conditions of endocrinal glands (pitutary, adrenal, thyroid, parathyroid & pancreas ). Newer methods of imaging.

**7) Genito Urinary system**

Imaging – conventional, Ultrasound, CT, MRI of various diseases including congenital conditions of genito urinary system.

Role of interventional radiology.

**8) Musculo Skeletal system**

Role of conventional, Ultrasound, Radio Nuclide studies, CT, MRI of diseases including congenital conditions of muscles, soft tissue, bones and joints.



**9) Soft tissue Radiology**

Include various soft tissue disorders and diseases and role of imaging.

**10) Interventional radiology**

Includes all procedures like interventional imaging and interventional treatment including angiography, angioplasty, aneurysmal coiling, stenting, embolization, etc.

**11) Recent trends and advances**

Includes all information published in National and International Journals with references. It includes endovascular Ultrasound, PACS, Digital X-rays, CT, MRI and Nuclear Medicine.

**Teaching and Learning Activities**

Candidate pursuing the course should work in the institution as a full time student. No candidate shall be permitted to run a clinic/laboratory/nursing home while studying postgraduate course. Each year should be taken as a unit for the purpose of calculating attendance. Every student shall attend teaching and learning activities during each year as prescribed by the department. Candidate shall not remain absent from work without valid reasons.

A list of teaching and learning activities designed to facilitate students acquire essential knowledge and skills outlined is given below.

**1. Lectures:**

Lectures are to be kept to a minimum. They may, however, be employed for teaching certain topics. Lectures may be didactic or integrated.

**a) Didactic Lectures:**

Recommended for selected common topics for postgraduate students of all specialties. Few topics are suggested as examples:

- 1) Biostatistics.
- 2) Use of library.
- 3) Research Methods.
- 4) Medical Code of Conduct and Medical Ethics.
- 5) National Health and Disease Control Programs.
- 6) Communication Skills, etc.
- 7) Initial introductory lectures about the subject.

These topics may preferably be taken up in the first few weeks of the 1st year.



**b) Integrated Lectures:**

These are recommended to be taken by multidisciplinary teams for selected topics, e.g. Jaundice, Diabetes Mellitus, Thyroid etc.

**2. Journal Club:**

Recommended to be held once a month. All the PG students are expected to attend and actively participate in discussion and enter relevant details in the log books. Further, every candidate must make a presentation from the allotted journal(s) of selected articles at least four times a year and a total of 12 presentations in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment. A timetable with names of the students and the moderator should be announced at the beginning of every year.

**3. Subject seminar:**

Recommended to be held once a month. All the PG students are expected to attend and actively participate in discussion and enter in the logbook relevant details. Further, every candidate must make a presentation from the allotted topics at least four times a year and a total of 12 seminars in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment. A timetable with names of the students and the moderator should be announced at the beginning of every year.

**4. Student Symposium:**

Recommended as an optional multi disciplinary programme. The evaluation may be similar to that described for subject seminar.

**5. Ward rounds:**

Ward round should be done as and when required and is more frequent in intervention.

**6. Mortality & Morbidity Meetings:**

Recommended periodically for all postgraduate students. Presentation is done by rotation and by students who had conducted / assisted procedure.

**7. Inter Departmental Meetings:**

Inter departmental meetings should be done periodically and these meetings should be attended by postgraduate students and relevant entries must be made in the Logbook.

**8. Teaching skills:**

Postgraduate students must teach undergraduate students (e.g. Medical, Nursing) by taking demonstrations, bed side clinics, tutorials, lectures etc. Assessment is made using a checklist by faculty. Record of their participation should be kept in



Logbook. Training of postgraduate students in Educational Technology is recommended.

**9. Continuing Medical Education Programmes (CME):**

At least 2 state / national level CME programmes should be attended by each student in 3 years.

**10. Conferences:**

Attending conferences is a must, at least 1 state / national in 3 years. However, participation & presentation of scientific paper should be regular.

**11. M.D. candidates should write dissertation in the form of article for publication and prepare PowerPoint for presentation.**

**Rotation Posting**

During the three year course, the student will work in the following areas:

**PROPOSED SCHEDULE FOR ROTATION OF RESIDENTS**

1 <sup>ST</sup> Year (1/6) (1/6)	Chest	Chest	Musculo-skeletal	G.U.	G.U.	US
	US	CT(H)	CT(B)	G.I.T.	G.I.T.	US
2 <sup>nd</sup> Year (3/6) (4/6)	Chest + Mammo graphy	Musculo Skeletal	Musculo Skeletal	G.I.T.	Emg.	CT(H)
	CT(B)	US+ Doppler	Intervention	US	Emg.	Nuclear Medicine
3 <sup>rd</sup> Year (5/6) (6/6)	CT(Head )	MRI	MRI	Intervention	Intervention	CT(B)
	MRI	Emg.	Intervention	US	Elective	Elective

**DISSERTATION: To be submitted after completion of the 5<sup>th</sup> term**



### Scheme of Examination

#### a) Theory

There shall be four question papers, each of three hours duration. Each paper shall consist of 10 short essay questions each carrying 10 marks. Total marks for each paper will be 100. Questions on recent advances may be asked in any or all the papers. Details of distribution of topics for each paper will be as follows:

<b>Paper – I</b>	Basic sciences as applied to Radio-Diagnosis – Radiological Anatomy Physiology, Pathology, Radiography, Radiation Physics and Biology. Basics and physics of Ultrasound, CT, Nuclear Medicine and MRI.
<b>Paper – II</b>	Cardiovascular system, Respiratory system, Chest, Mammography, recent advances.
<b>Paper – III</b>	Gastrointestinal system and abdomen (including Pancreas, Adrenals, Biliary tree, Spleen, Liver and acute abdomen). Genitourinary, Retroperitoneum, Obst. & Gynaec, recent advances
<b>Paper – IV</b>	CNS including head & neck, musculoskeletal System, ENT & Eye, recent Advances.

**Note: The distribution of chapters/topics shown against the papers are suggestive only and may overlap or change.**

#### b) (i) Clinical (Practical): 200 Marks

- a) Long Case – One – 100 Marks
- b) Short Case – two – 100 marks (50 x 2)

#### (ii) Viva-Voce: 200 Marks

- 1) Viva-voce Examination – [150 marks]

All examiners will conduct viva-voce conjointly on candidates comprehension, analytical approach, expression and interpretation of data. It includes all components of course contents, spotters of conventional, newer imaging techniques and instruments. In addition, candidates may also be given case reports, charts, gross specimens, etc., for interpretation. It includes discussion on dissertation also.

- i) Spot film Diagnosis
- ii) Rapid sequence
- iii) Radiation Physics session
- iv) Radiography Techniques
- v) Contrast Media
- vi) Dissertation

- 2) Internal assessment and Log Book – [50 marks]

Candidate is asked to make a presentation for 8 to 10 minutes on the dissertation topic and the review of Log Book.

Maximum marks for M.D. Radio-Diagnosis	Theory	Practical	Viva	Grand Total
	400	200	200	800



**Recommended Text Books: (Latest Edition)**

- 1) Netters Concise Radiologic Anatomy 2009  
Author: -By Weber, Edward C and Vilensky Joel A.
- 2) Textbook of Radiology and imaging Vol. I & II 2014.  
Author: - David, Sutton.
- 3) Diagnostic Radiology A textbook of medical imaging Vol. I & II 6/2015.  
Author: - Grainger and Allison.
- 4) Diagnostic ultrasound Vol. I & II 4/2011  
Author: -Rumack, Carolm & Wilson
- 5) Handbook of Radiology & imaging 1/Reprint/2006  
Author: -Ami Shah.
- 6) Radiology and imaging for medical students 7/2013  
Author: -Sutton, David.
- 7) Physics of Diagnostic Radiology, 4/2012  
Author: -Christensens
- 8) Radiology Review 7/2012  
Author: -Dahnert and Wolfgang.
- 9) Clinical Sonography A practical guide, 4/2012  
Author: -Sonders and winter
- 10) Diagnostic imaging brain 2<sup>nd</sup> 2010  
Author: -Osborn and salzman.
- 11) AIDS to Radiological Differential diagnostics 5<sup>th</sup> edition 2009  
Author: -Chapman, Nakedly
- 12) Positioning in Radiology 2015  
Author: Clarks Radiography
- 13) A guide to Radiological procedures 2005  
Author: chapman Stephan

**Reference Books: (Latest editions)**

- 1) Essentials of skeletal Radiology Vol. I & II 2/2005.  
Author: Yochum and Rowe.
- 2) MRI of musculoskeletal system 6/2013  
Author: Berquist Thomas H
- 3) Introduction to vascular ultrasound 6/2012  
Author: -Pellerito John S. and Polak
- 4) Atlas of radiographic positioning and procedures vol I, II & III 2012  
Author: Merrill's
- 5) High resolution CT of Lung 4/2009  
Author: Webb. Co. Richard





- 6) CT & MRI of Whole body Vol. I & II 5/2009  
Author: Haaga.
- 7) Magnetic Resonance Imaging of Brain and Spine Vol. I & II 4/2009  
Author: Atlas, Scott W.
- 8) Computed body tomography with MRI correlation Vol. I & II 4/2006/latest edition  
Author: -Lee and Sogel
- 9) Bone and joint imaging 3/2005  
Author: Resnick and Kranudrol
- 10) Roentgen science in diagnostic imaging  
Author: Meschca
- 11) Radiology of skeletal pauma Vol. I/II 3/1992
- 12) Handbook of intervention Radiological procedures  
Author: Meochan
- 13) Principles of internal medicine Vol. I & II 2008  
Author: Harrisons'
- 14) Review of medical physiology 23/2010  
Author: Ganong's

#### **Journals**

1. Indian Journal of Radiology and Imaging
2. Clinical Radiology – Journal of The Royal College of Radiologists
3. British Journal of Radiology
4. American Journal of Roentgenology
5. Radiology clinics in North America
6. Seminar in Ultrasound
7. Journal of Vascular and Interventional Radiology
8. Journal of Indian Academy of Oral Medicine and Radiology
9. JAPI; Journal of Association of Physicians of India
10. Journal of Neuroscience in Renal Practice
11. Medical Journal of D. Y. Patil University



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### List of Radiology e-journals

Sr. No.	Title of the e-journal
1	American Journal of Neuroradiology
2	Applied Radiology
3	Approaches To Differential Diagnosis In Musculoskeletal Imaging
4	Basic Chest X-Ray Review
5	Basics of MRI
6	Body Image Teaching Files
7	Brigham RAD Teaching Case Database
8	British Journal of Radiology
9	Canadian Association of Radiologists Journal
10	Cardiothoracic Imaging
11	Case of the Month
12	CHORUS Collaborative Hypertext of Radiology
13	Diagnostic and: Interventional Radiology
14	Digital Database for Screening Mammography (DDSM)
15	Emory Radiologic Anatomy
16	Imaging Journal (British Institute of Radiology)
17	Indian Journal of Radiology And Imaging
18	Internet Journal of Radiology
19	Introduction to Clinical Disciplines Medicine: Radiology
20	Journal of-Vascular and Interventional Radiology
21	Journal of Ultrasound
22	Korean Journal of Radiology
23	McGill Radiologic Anatomy
24	Musculoskeletal Imaging Teaching Files
25	Normal Radiologic Anatomy: X-Ray, CT, MRI and Ultrasound
26	Radiologic Science and Education
27	Radiology
28	Radiographic
29	Radiology Clinics of North America



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### List of Radiology e-journals

Sr. No.	Title of the e-journal
1	ADRENAL IMAGING
2	CT AND MR ANGIOGRAPHY OF THE PERIPHERAL CIRCULATION
3	DISEASES OF THE BRAIN, HEAD & NECK, SPINE
4	ELECTRICAL.NEUROIMAGING
5	EMERGENCY CHEST IMAGING
6	EMERGENCY RADIOLOGY
7	ESSENTIAL RADIOLOGICAL ANATOMY FOR THE MRCS
8	GROWTH OF THE PEDIATRIC SKELETON
9	HANDBOOK OF CARDIOVASCULAR MAGNETIC RESONANCE IMAGING
10	INTERPRETING.CHEST.X-RAYS
11	INTERVENTIONAL RADIOLOGY OF THE SPINE
12	MC GRAW HILL SPECIALITY BOARD REVIEW RADIOLOGY
13	MRI CLINICAL PRACTICAL
14	PEDIATRIC RADIOLOGY REVIEW
15	PET-CT IN RADIOTHERAPY TREATMENT PLANNING
16	POCKET ATLAS OF RADIOGRAPHIC ANATOMY
17	PRACTICAL MRI OF THE FOOT AND ANKLE
18	PROBLEM BASED OBSTETRIC ULTRASOUND
19	RADIOLOGY SOURCEBOOK
20	STEREOTACTIC BODY RADIATION THERAPY
21	THE PHYSICS OF RADIATION THERAPY