

**SYLLABUS/CURRICULUM
POSTGRADUATE COURSES**

M.D.RADIODIAGNOSIS

Similar syllabus is prevalent in most of the universities in India and in the region.

Syllabus is a dynamic document and evolves over a period of time in view of new information, inputs, research findings and teaching methodologies. For example, the Clinical Skills Laboratory, OSCE and OSPE were not in vogue at the time of launch of the MBBS course; however it has been subsequently included in the syllabus.

As such, proposed PG syllabus too is open to revision in light of new inputs in future.

M.D. Radiodiagnosis

1. Specific Title:

M.D. Radiodiagnosis.

2. Objectives:

The three year course in Radiodiagnosis is aimed at imparting training in both conventional radiology and 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. Candidate should be well versed with medical ethics and consumer protection act and the Prenatal Diagnostic legislation.

A resident on completing his/her MD (Radiodiagnosis) should have acquired 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, and be able to

- Independently conduct and interpret all routine and special radiological and imaging investigations.
- Provide radiological services in acute emergency and trauma including its medico legal aspects.
- Elicit indications, diagnostic features and limitation of application of ultrasonography, CT and MRI and should be able to describe proper cost-effective algorithm of various imaging techniques in a given problem setting.
- Perform (under supervision) basic image guided interventional procedures for diagnosis and therapeutic management.
- Formulate basic research protocols and carry out research in the field of radiology related clinical problems.
- 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.
- To interact with other specialists and super-specialists so that maximum benefit to the patient accrues.
- Work as a Senior Resident/consultant in Radiodiagnosis and conduct the teaching programme for undergraduates, postgraduates as well as paramedical and technical personnel.
- Organize CME in the specialty utilizing modern methods of teaching and

evaluation.

3. General Entry Requirements:

- Successful completion of an undergraduate Medical degree (MBBS) with completion of Compulsory Rotating Internship.
- Registration with Medical Council.

A Merit List will be compiled based on All India NEET and admission is given accordingly

4. Programme Duration:

The period of training for M.D. and M.S. courses shall be three years after registration of the candidate Any candidate, after registration for any of the Degree/Diploma course, can not have a break of more than three months (six months in case of medical emergencies like pregnancy during residency period) at a stretch during the period of training and must appear in the final examination within 5 years of the date of his registration, failing which his/her registration shall be treated as cancelled automatically.

Further, if a candidate selected for the course is subsequently appointed for Government service and if she/he discontinues the studies during the tenure up to three years as Resident/Registrar, his/her registration shall continue provided he/she has got such appointment with permission to pursue his/her studies in the same subject, failing which his/her registration shall be treated as cancelled automatically.

Course	Full-Time
Master's Degree (MD)	6 Semesters

5. Assessment

All the PG residents are assessed daily for their academic activities and also periodically.

5.1. General Principles

The assessment is valid, objective, and reliable.

It covers cognitive, psychomotor and affective domains.

Formative, continuing and summative (final) assessment is also conducted in theory as well as practicals. In addition, dissertation is also assessed separately.

5.2. Formative Assessment

The formative assessment is continuous as well as end-of-term. The former is based on the feedback from the senior residents and the consultants concerned. All the consultants of the unit in which resident is working will give marks based on performance. These marks will be summated over a period of tenure. End-of-term assessment is held at the end of each semester (upto the 5th semester). Formative assessment will provide feedback to the candidate.

5.3. Internal Assessment

The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student. Marks should be allotted out of 100 as followed.

Sr. No.	Items	Marks
1.	Practical Work	25
2.	Academic activities	25
3.	End of term theory examination	25
4.	End of term practical examination	25

(1) Practical Work:

Availability: Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.

Diligence: Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.

Academic ability: Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.

Clinical Performance: Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing radiological procedures and handling emergencies.

(2) Academic Activity: Performance during presentation at Journal club/ Seminar/ Case discussion/Stat meeting and other academic sessions. Proficiency in skills as required.

(3) **End of term theory examination** conducted at end of 1st, 2nd year and after 2 years 9 months

(4) **End of term practical/oral examinations** after 2 years 9 months.

Marks for **clinical work** should be given annually by all the consultants under whom the resident was posted during the year. Average of the three years should be put as the final marks out of 25.

Marks for **academic activity** should be given by the all consultants who have attended the session presented by the resident.

The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examinations.

5.4. Summative Assessment

Ratio of marks in theory and practicals will be equal.

The pass percentage will be 50%.

Candidate will have to pass theory and practical examinations separately

A. Theory Examination (Total= 400)

Paper	Title	Marks
Paper 1	Basic sciences related to radiology	100
Paper 2	Principles and practice of Radio-diagnosis	100
Paper 3	Radio-diagnosis as related to pathology	100
Paper 4	Recent advances & radiology as applied to other specialties	100

Each paper should have two long questions of 25 marks each and 5 of 6 short notes of 10 marks each.

B. Practical Examination and Viva voce (Total=400)

Clinical Exam	Number	Marks
Long Case	One	100
Short case	Two	100
Imaging spots + Rapid reading of selected films	Thirty + twenty	60+40
Radiation Physics Viva		50
Practical Radiography / USG demonstration		50

FINAL ASSESSMENT (Total=1000)

Theory	400
Practicals and Viva voce	400
Dissertation	100
Internal Assessment	100
Total Marks:	1000

6. Plan of Study:

6.1. General Principles

- Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skills oriented.
- Learning in postgraduate program is essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

6.2. Teaching Sessions

In addition to conducting and reporting of routine and special investigation in the area of posting under direct supervision, formal teaching session to be held on working days. These include seminars in physics and general radiology, journal clubs, case presentations; Interdepartmental meets, Film reading session.

6.3 Teaching schedule

The suggested teaching schedule of the department will be as follows:

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|-----------------------------------|-------------|
| 1. Seminar | Once a week |
| 2. Film Reading | Once a week |
| 3. Case presentation | Once a week |
| 4. Inter department meet | Once a week |
| 5. Journal club | Once a week |
| 6. Film Reading / Physics Seminar | Once a week |

Lectures on different topics are given by the consultants every month.

All sessions are attended by the faculty members. All PGs are supposed to attend the

sessions except the ones posted in ICU and emergency.

All the teaching sessions are assessed by the consultants at the end of session and kept in the office for internal assessment.

The PG students will be involved in clinical teaching of undergraduate students from the first year whereas the PG students in the third year will take undergraduate classes in the evenings. This helps them to prepare and make them confident in clinical presentation. The undergraduate students are encouraged to clarify their doubts and sharpen their clinical skills.

Ward rounds may be service or teaching rounds. Service rounds should be taken every day for the care of patients and every unit should have grand rounds for teaching purpose. Entry of both the rounds should be made in Log Book.

Recommended that at least two CME programmes should be attended by each student during the three year tenure.

Attending conferences is encouraged although it is optional.

6. Postings

The postgraduate student should be posted in all sections (Conventional radiology, U/S, CT, MRI etc.) so that there is adequate exposure to all modalities.

The proposed duration of postings is as under:

Conventional	6 months
-U/S	15 tmonths
-CT / MRI	15 tmonths

SCHEDULE FOR ROTATION OF RESIDENTS

Semester						
I	Musculoskeletal	Emergency	US	US	Chest	Chest
2	GU	GU	GIT	GIT	CT	CT
3	US	US	Chest	Musculoskeletal	Emergency	Emergency

4	CT	CT	US/CT Intervention	US	MRI	MRI
5	GIT	GIT	US	US/CT Intervention	CT	CT
6	MRI	MRI	US	Chest	Elective	Elective

Contact Hours:

Hours/day	<u>3</u>
Days /week	<u>5</u>
Duration (weeks)	continuous
Hours/3 years (40 weeks / year)	1800

Hours of Clinical Practice (Total : 1800) :

<u>Year</u>	<u>Supervised (hours)</u>	<u>Independent (hours)</u>
First	600	nil
Second	400	200
Third	100	500

The clinical service to be provided by the trainees will depend upon the following conditions:

1. The student's stage in the course.
2. The student's individual proficiency.
3. The complexity of the procedure/ intervention.
4. Relevant co-morbid factors.
5. The patient's express and informed consent.

The final decision will be at the discretion of the supervising faculty in concurrence with the unit head.

8. Dissertation:

Every candidate shall carry out work on an assigned research project under the guidance of a recognized postgraduate teacher, the project shall be written and submitted in the form of a Dissertation.

Every candidate shall submit Dissertation plan to the University within time frame set by university.

Dissertation shall be submitted to the University six months before the commencement of final theory examination i.e. for examination May/June session, 30th November of the preceding year of examination and for November/December session 31st May of the year of examination.

The student will

- Identify a relevant research problem
- conduct a critical review of literature;
- formulate a hypothesis;
- determine the most suitable study design;
- state the objectives of the study;
- prepare a study protocol;
- undertake a study according to the protocol;
- analyze and interpret research data, and draw conclusions;
- write a research paper.

Dissertation : Marking Scheme:

Serial No.	Items	Marks
1	Topic and Title	10
2	Introduction	15
3	Critical Review of literature related to research topic	15
4	Critical appraisal of methods and materials applied to the research topic	15
5	Capability to apply observational methods to interpret and analyse the data	15
6	Capability on drawing conclusion (Discussion)	20
7	Bibliography / References	10
	Total	100

9. Syllabus (Standard Implementation Plan: detailed in logbook)

During the training period, efforts are always made that adequate time is spent in teaching the students skill required for performing basic radiological procedures and making them accustomed to handling difficult and critical diagnoses.

9.1. Theory

Basic science related to the specialty of Radiodiagnosis

Radiation Physics and Radiation Biology

- * Introduction to general properties of radiation
- * Production of X-Ray
- * Characteristic properties of X-Ray
- * Interaction of X-Rays with matter and their effects
- * Units of radiation, radiation measurement
- * Image receptors . X-Ray film, intensifying screen
- * Formation of radiographic image
- * X-Ray equipments .Conventional X-Ray Units, Fluoroscopy units (conventional, image intensifier), Advanced imaging equipments. US, CT, MRI, Angiography, cine fluoroscopy and cine angiography
- * Film procession dark room equipments and procedures-manual, automatic,
- * Day light processing
- * Ultrasound Physics: Principe, transducer composition & types, sonography equipment details.
- * CT Physics: Principle, various generations of CT, Advances in CT.
- * MRI Physics: Principle, Types, Different protocols.

Quality assurance

Radiation hazards and radiation protection

Contrast media . types, chemical composition, mechanism of action, dose schedule, route of administration, adverse reaction and their management.

Nuclear Medicine. Diagnostic use of important isotopes in different organ systems.

Instruments/equipment in Nuclear Medicine and their recent advances.

Picture archiving and communication system (PACS) and Radiology information system (RIS) to make a film less department.

Respiratory System

Disease of the chest wall, diaphragm, pleura and airway; pulmonary vasculature; pulmonary; infections; pulmonary neoplasm; diffuse lung disease; mediastinal disease; chest trauma; post-operative and intensive care imaging.

Gastrointestinal (GIT) and Hepato-Biliary-Pancreatic System

Diseases and disorders of mouth, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, diseases of omentum, peritoneum and mesentery, acute abdomen, abdominal trauma. Diseases and disorders of hepato-biliary-pancreatic system. Conventional and other imaging methods like US, CT, MRI, DSA and isotope studies pertaining to these systems.

Genito-Urinary System

Various diseases and disorders of genito-urinary system. These include: congenital inflammatory, traumatic, neoplastic, calculus disease and miscellaneous conditions. He/she should also be able to perform and interpret conventional and other diagnostic imaging procedures used to evaluate urinary tract pathology i.e., ultrasound, CT, MRI, angiography. He/She should be able to perform vascular/non-vascular interventions of genito-urinary system.

Musculoskeletal System

Imaging (Conventional, Ultrasound, CT, MRI, angiography, Radio-isotope studies) and interpretation of disease of muscles, soft tissue, bones and joints including congenital inflammatory, traumatic, metabolic and endocrine, neoplastic and miscellaneous conditions.

Cardiovascular Radiology

Diseases and disorder of cardiovascular system (congenital and acquired conditions) and the role of imaging by conventional radiology, ultrasound, Color-Doppler, CT, MRI, angiography radio nuclide studies.

Neuro-Radiology

Includes imaging (using conventional and newer methods) and interpretation of various diseases and disorders of the head, and spine covering congenital, infective, vascular, traumatic and neoplastic conditions. This will also include disease of the eye and ENT.

Radiology Emergency Medicine

The student should be able to evaluate emergency radiographic examinations with reasonable accuracy and have clear understanding of the protocol of imaging in emergency situations of different organ systems.

Mammography and Breast Intervention

Role of screen film mammography (conventional and digital) in screening of breast cancer, benign and malignant lesions of the breast.

General Radiology

Conventional Radiology

The student should be able to evaluate conventional radiographs including radiographs on chest abdomen, pelvis, skull (including PNS + Orbit), spine, musculoskeletal and soft tissues. Student should be able to perform radiography of different body parts.

Ultrasound

The student should be able to perform and interpret all ultrasound studies. These studies include: abdomen, pelvis, small parts, neonatal head, breast, color-duplex imaging (arterial and venous studies), obstetric/gynecology and intervention procedures using ultrasound guidance.

CT

- * Select CT protocol according to the clinical diagnosis.
- * Demonstrate knowledge of the CT finding of the common pathological conditions.
- * Interpret conventional and modified body CT examinations.
- * Know limitations of CT in the diagnosis of certain diseases.
- * Perform CT guided simple interventions (under supervision)

Angiography

The student should be able to interpret and preferably perform (under supervision) routine angiographic procedures and vascular interventions.

MRI

- * Select MRI protocol according to the clinical diagnosis
- * Knowledge of conventional and modified MRI examinations, including MRA, MRV, MRCP, MRS.
- * Demonstrate knowledge of the MRI of the common pathological conditions.

Interventional Radiology

The student should be able to perform (under supervision) simple interventional procedures of all the organ systems.

9.2. Practical

Practical Schedule –Physics

- ❖ Film characteristics
- ❖ Effectiveness of Lead Apron and other protective Devices
- ❖ Beam parameters check
- ❖ Optical Radiation field alignment
- ❖ Assessment of Scatter radiation
- ❖ Quality control of X-rays and Imaging equipments
- ❖ Evaluation of performance of a film processing unit

Practical radiography

- ❖ Dark room techniques
- ❖ Radiography of the extremities
- ❖ Radiography of the spine, abdomen, pelvic girdle and thorax
- ❖ Radiography of the skull
- ❖ Contrast techniques and interpretation of GI tract, biliary tract, etc.
- ❖ Contrast techniques and interpretation of the Genito-urinary system
- ❖ Contrast techniques and interpretation of the central nervous and Cardiovascular system
- ❖ Miniature radiography, Macro-radiography and magnification techniques
- ❖ Dental and portable radiography

Anatomy

Gross and cross sectional Anatomy of all the body systems

Pathology

Gross morphology of pathological condition of various systems

Contrast Media

Their types, formulations, mechanism of action, dose schedule, routes of administration, adverse reactions and their management.

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