

Curriculum

MD RADIO-DIAGNOSIS

PROGRAMME OBJECTIVES:

Knowledge:

The candidate qualifying for the award of MD in Radio diagnosis and imaging should have a clear understanding of the following:

1. The process of x-rays and gamma ray production, their characteristics and interaction with matter.
2. The physical principles of signal detection, radiological image formation and the factors governing image quality.
3. The biological effects of radiation and the principle and practice of radiation protection, including the relevant regulations and recommendations of the AERB.
4. The fundamental principles of Radio nuclear pharmaceuticals, imaging techniques and interpretation of abnormal nuclear scans.
5. The gross and multiplanar anatomy of CNS, CVS, respiratory, GIT, urogenital & Musculoskeletal system and other organs.
6. Correlation of gross pathology of disease with imaging features.
7. Indications, diagnostic features and limitation of plain radiography, contrast radiography, fluoroscopy, ultrasonography, CT, MRI and catheter angiography in the imaging of various organ systems.
8. Overall diagnostic strategies (including non radiological tests) and management options in major clinical syndromes.
9. Current developments and future trends in imaging technology and practice.

Clinical Skills:

The candidate at the end of training should be able to do the following:

1. Independently perform and interpret routine radiography and ultrasound/doppler studies.
2. Independently perform and interpret radiological special investigations pertaining to the GI tract, urogenital tract, sinograms, fistulograms etc
3. Independently interpret routine spiral CT ,MDCT and MRI studies.
4. Perform conventional catheter aortograms, visceral and cerebral angiograms under supervision. Assist simple angioplasty and embolisation procedures.
5. Perform simple guided interventions like biopsies, aspirations and catheter drainage of abscesses.
6. Independently interpret relevant imaging in acute emergencies and trauma and understand the medico legal aspects.
7. Derive a cost effective algorithm of various imaging techniques in a given problem setting.
8. Develop the capacity and motivation for continued self-learning.
9. Use the PACS effectively to enhance workflow efficiency.

Teaching and Research:

1. Teach the undergraduates and postgraduates in the specialty and to train related medical, paramedical and technical personnel.
2. Identify problems for research in the specialty particularly relevant to the disease pattern of the country and plan rational approach to achieve its goal.

DURATION OF COURSE (3 YEARS).

TRAINING SCHEDULE

1 st Year APPLIED PHYSICS &BASIC SCIENCES	2 nd year	3 rd year
I – Conventional Chest Radiology II - Musculoskeletal Radiology III– Conventional and special GIT IV– Conventional and special GU V – 2D Ultrasound VI– Doppler Sonography	I – CT II - Vascular Radiology III –Neuroradiology IV – Emergency Radiology V– Nuclear Medicine VI– Pediatric Radiology	I – Neuro Surgery / Neurology II- Surgical Gastro / Gastroenterology III- Elective in Radiology IV- MDCT V – MRI VI - Interventional Radiology

- During each unit posting, candidate should be able to perform the procedures and interpret the findings.
- Formal assessment at the completion of posting in each unit.

SUBJECT CONTENT

Physics:

1. Introduction to general properties of radiation and matter. Fundamentals of nuclear physics and radioactivity.
2. Production of x-rays.
3. X-ray generating apparatus, fluoroscopy.
4. Interactions of x-rays and gamma rays with matter and their effects on irradiated materials.
5. Measurement of X and gamma rays.
6. Interaction of X-rays with the patients.
7. The Radiological image.
8. The Image Receptor including CR and DR systems.
9. Radiation protection.
10. Quality assurance.
11. PACS.
12. Principles of conventional, spiral and MDCT.
13. Principles of Diagnostic Ultrasound and doppler.
14. Nuclear Magnetic Resonance and imaging.
15. Radionuclide imaging (Gamma camera, spect, PET).

Theoretical Knowledge:

The clinical features, imaging anatomy, imaging findings and management strategies of relevant diseases in the organ systems:

1. Bones and joints
2. Respiratory system
3. Cardiovascular system
4. Gastro intestinal tract
5. Urogenital tract
6. Head & Neck including orbits.
7. Imaging Obstetric and Gynecology
8. Teeth, soft tissue and breast
9. Endocrine system
10. Clinical (applied) radionuclide imaging.

11. Interventional radiology related to different systems of body.
12. Contrast agents: Contrast media, their types, formulation, mechanisms of action, dosage, routes of administration, adverse reactions and their management and recent developments.

Practical Experience:

1. Radiography of the chest.
2. Radiography of the spine, extremities, abdomen, pelvic girdle and thorax.
3. Radiography of the skull.
4. Contrast techniques of GI tract, Biliary tract, GU tract.
5. Portable radiography, emergency and pediatric radiography.
6. Dark room technique.
7. Positioning, performing and interpreting a CT study.
8. Positioning, performing and interpreting an MR study.
9. Performing a diagnostic angiogram and its pre and post procedure care.
10. Performing USG / CT guided aspirations and catheter drainage.
11. Performing and interpreting USG and Doppler studies.
12. Develop a systematic, lucid and clinically oriented reporting style.
13. Develop skills for workstation based reporting.
14. Develop ability to use Hospital information system to maximize diagnostic accuracy and reporting speed.
15. Develop specialised computer skills for creating high quality presentations.

Guidelines for Teaching and Learning Activities:

A candidate pursuing the course should work in the institution as a full time student. No candidate should 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 and not absent himself/herself 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:

- 1) Bio-statistics.
- 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.

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 week. All the PG students are expected to attend and actively participate in discussion and enter in logbook relevant details. 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 (evaluation sheet 1). A timetable with names of students and moderator should be announced at the beginning of every year.

3. **Subject seminar** : Recommended to be held once a week. All the PG students are expected to attend and actively participate in discussion and enter in the logbook relevant details. Further every candidate must present selected topics at least four times a year and a total of 12 seminar presentations in three years. The presentations should be evaluated using checklists and would carry weightage for internal assessment (evaluation sheet 1). A timetable with names of students and 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. **Inter Departmental Meetings** : Strongly recommended particularly with departments of Surgery, Orthopedics and Medicine at least once a month. These meetings should be attended by postgraduate students and relevant entries must be made in the Logbook.
6. **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.
7. Department internal audit meetings: Once a month internal meetings to audit patient care, reporting and other operational issues.
8. **Continuing Medical Education Programmes (CME)** : At least 2 state / national level CME programmes should be attended by each student in 3 years.
9. **Conferences** : Attending conferences is optional. However participation & presentation of scientific paper should be encouraged.

Guidelines for Monitoring Learning Progress

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps the teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching learning activities. It may be structured and assessment be done using checklists that assesses various aspects.

The learning out comes to be assessed should include: (a) Personal Attitudes (b) Acquisition of Knowledge, (c) Clinical and operative skills, (d) Teaching skills and (e) Dissertation.

a) **Personal Attitudes**. The essential items are:

- Caring attitudes
- Initiative
- Organisational ability

- Potential to cope with stressful situations and undertake responsibility.
- Trust worthiness and reliability
- To understand and communicate intelligibly with patients and others
- To behave in a manner which establishes professional relationships with patients and colleagues.
- Ability to work in team.
- A critical enquiring approach to the acquisition of knowledge.

The methods used mainly consist of observation. It is appreciated that these items require a degree of subjective assessment by the guide, supervisors and peers.

b) Acquisition of Knowledge : The methods used comprise of ‘Log Book’ which records participation in various teaching / learning activities by the students. The number of activities, attended and the number in which presentations are made are to be recorded. The logbook should periodically be validated by the supervisors. Some of the activities are listed. The list is not complete. Institutions may include additional activities, if so, desired.

Journal Review Meeting (Journal Club) : The ability to do literature search , in depth study, presentation skills and use of audio-visual aids are to be assessed.

Seminars / Symposia : The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio-visual aids are to be assessed using a checklist.

Clinico-pathological conferences : This should be multidisciplinary case study of an interesting case to train the candidate to solve diagnostic and therapeutic problems by using an analytical approach. The presenter(s) are to be assessed using a checklist similar to that used for a seminar.

Medical audit : Periodic morbidity and mortality meetings be held. Attendance and participation in these must be insisted upon. This may not be included in assessment.

c) **Clinical skills**

Day to Day work : Skills in outpatient and ward work should be assessed periodically. The assessment should include the candidates' punctuality, analytical ability and communication skills.

Clinical Meetings : Candidates should periodically present cases to his peers and faculty members. This should be assessed using a checklist.

Clinical and Procedural skills : The candidate should be given graded responsibility to enable learning by apprenticeship. The performance is assessed by the guide by direct observation. Particulars are recorded by the student in the logbook.

- d) **Teaching skills** : Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any..
- e) **Dissertation in the Department** : Periodic presentations are to be made in the department. Initially the topic selected is to be presented before submission to the University for registration, again before finalisation for critical evaluation and another before final submission of the completed work (evaluation sheet 2).
- f) **Periodic tests** : The departments may conduct three tests, two of them be annual tests, one at the end of first year and other in the second year. The third test may be held three months before the final examination. The tests may include written papers, practicals / clinicals and viva voce.
- g) **Work diary / Log Book** : Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal reviews, seminars etc. Special mention may be made of the presentations by the candidate as well as details of clinical or laboratory procedures, if any conducted by the candidate.
- h) **Records** : Records. Logbooks and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University or MCI.

Log book

The logbook is a month wise record of the important activities of the candidates during his / her training. Internal assessment should be based on the evaluation

of the logbook. Collectively, logbooks are a tool for the evaluation of the training programme of the institution by external agencies. The record includes academic activities as well as the presentations and procedures carried out by the candidate.

Final Assessment

All the papers to be set by 3 internal examiners jointly and moderated by one external examiner.

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|-----------|--------------------------------------------------------------------------------------|
| a) Theory | 50% |
| Paper I | Basic sciences & radiation physics. |
| Paper II | CVS Resp.G IT (including Hepato biliary), Endocrine. |
| Paper III | Genitourinary Retro peritoneum, CNS, Musculoskeletal system, Obst.&Gynae, ENT & Eye. |
| Paper IVs | Recent advances & nuclear medicine. |

All papers would consist of short answer question covering all aspects of the course.

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|--------------|---------------------------------------------------------|-----|
| b) Practical | 50% | |
| 1. | One long & two short cases | 50% |
| 2. | Film Quiz 40-50 spots | 25% |
| 3. | Radiation Physics | 5% |
| 4. | Equipment & accessory related to Radiology and contrast | 5% |
| 5. | Radiological & imaging procedure | 10% |
| 6. | Gross pathology | 5% |

THESIS FOR MD RADIO DIAGNOSIS AND IMAGING:

Objectives

1. The student would be able to demonstrate capability in research by planning, conducting systematic scientific inquiry, data analysis and derive conclusions.
2. Understand statistical methods used for evaluating an imaging modality and comparing two or more imaging modalities.

Dissertation

1. Every candidate pursuing MD/MS degree course is required to carry out work on a selected research project under the guidance of a recognized post graduate teacher. The results of such a work shall be submitted in the form of a dissertation.
2. The dissertation is aimed to train a postgraduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of research study, collection of data, critical analysis, comparison of results and drawing conclusions.
3. Every candidate shall submit to the Registrar (Academic) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work six months from the date of commencement of the course on or before the dates notified by the University. The synopsis shall be sent through the proper channel.
4. Such synopsis shall be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University.
5. The study should be approved by the Institution Ethics Committee.

6. The dissertation should be written under the following headings:
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|---------------------------------|--------------------------------|
| a) Introduction | b) Aims or Objectives of study |
| c) Review of Literature | d) Material and Methods |
| e) Results | f) Discussion |
| g) Conclusion | h) Summary |
| i) References (Vancouver style) | j) Tables |
| k) Annexures | |
7. The written text of dissertation shall not be less than 50 pages and shall not exceed 100 pages excluding references, tables, questionnaires and other annexures. It should be neatly typed in double line spacing on one side of the paper (A4 size, 8.27" x 11.69") and bound properly. Spiral binding should be avoided. The dissertation shall be certified by the guide, head of the department and head of the institution.
8. Four copies of dissertation thus prepared shall be submitted to the Registrar (Evaluation), six months before final examination on or before the dates notified by the University.
9. The dissertation shall be valued by examiners appointed by the University. Approval of dissertation work is an essential precondition for a candidate to appear in the University examination.

LOG BOOK FORMAT
Amrita School of Medicine,
Amrita Institute of Medical Sciences
Kochi, Kerala

LOGBOOK

MD RADIODIAGNOSIS

Log book for the month of:

WORKED UP CASES

CASE 1:

Name:

Age/Sex:

MRD

CLINICAL REFERENCE:

RADIOGRAPHIC FEATURES

X RAY CHEST:

FOLLOW UP:

CASE 2:

Name: Age/Sex: MRD

CLINICAL REFERENCE:

RADIOGRAPHIC FEATURES

X RAY CHEST:

ECHOCRADIOGRAM

FOLLOE UP:

PROCEDURES PERFORMED UNDER SUPERVISION

DATE	MRD	PROCEDURE	INDICATION	COMPLICATIONS	FOLLOWUP

LECTURES AND PRESENTATIONS

SRL NO	TYPE	DATE	TOPIC	PRESENTED /ATTENDED
1				
2				
3				
4				
5				
6				
7				
8				

REPORTING RECORD

PLAIN PADIOGRAPHS REPORTED	
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SPECIAL INVESTIGATIONS

MODALITY	NUMBER OF CASES
BARIUM STUDIES	
UROGRAPHIC STUDIES	
OTHERS	

ULTRASOUND

TYPE	NUMBER OF CASES
GENERAL ULTRA SOUND	
OBSTETRIC ULTRA SOUND	
NEUROSONOGRAM	
DOPPLER STUDIES	
SMALL PARTS	

CT SCANS REPORTED	
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MRI REPORTED	
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DATE:

SIGNATURE OF HEAD OF DEPARTMENT

ANNEXURE VI

6 MONTHLY EVALUATION SHEET – PRESENTATIONS/JOURNAL CLUB

FOR THE PERIOD.....

Date:

Sl.No.	Point to be considered	Scoring
1	Presentations	
2	Whether all relevant points elicited	
3	Cogency of presentation	
4	Logical order	
5	Mentioned all positive and negative points of importance	
6	Whether any major signs missed or misinterpreted	
7	Diagnosis: whether it follows logically from history and findings	
8	Investigations required: - complete list - relevant order - interpretations of investigations	
Overall:		
1	Ability to react to questioning – whether answers relevant and complete	
2	Ability to defend diagnosis	
3	Ability to justify differential diagnosis	

4	Confidence	
5	Others	

Guidance for scoring:

0 Poor	1 Below average	2 Average	3 Above average	4 Very good
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Total score:

Sl. No.	Faculty Name
1	
2	
3	
4	

ANNEXURE V

QUARTERLY EVALUATION SHEET – PRACTICAL WORK

Name:

Date:

Sl. No.	Point to be considered	Score
1	Punctuality	
2	Regularity of attendance	
3	Quality of ward work	
4	Presentation of cases	
5	Beside manners	
6	Rapport with patients	
7	Rapport with colleagues	
8	Undergraduate teaching (if applicable)	
9	Others	

Guidance for scoring:

0 Poor	1 Below average	2 Average	3 Above average	4 Very good
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Total score: