



D.Y. PATIL EDUCATION SOCIETY
[Deemed to be University], Kolhapur
Re-accredited by NAAC with 'A' Grade

D. Y. PATIL

MEDICAL COLLEGE

KOLHAPUR

Syllabus For

NATIONAL MEDICAL COMMISSION

Postgraduate Medical Education Board

GUIDELINES FOR COMPETENCY BASED
POSTGRADUATE TRAINING PROGRAMME FOR

MD IN RADIODIAGNOSIS

D. Y. PATIL EDUCATION SOCIETY, KOLHAPUR
(DEEMED TO BE UNIVERSITY)



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MD IN RADIODIAGNOSIS

Year of Implementation : 2022-23

Year of Examination : 2025-26

MD- Radiodiagnosis

Vision

To be recognized as one of the premier radiology departments.

Mission

To train post graduate students comprehensively through excellence in teaching and mentoring, advances in imaging research and through expertise in medical imaging and interpretation.

Goal of this program is to impart training in conventional and modern radiology and imaging techniques so that the post graduate student becomes well versed and competent to practice, teach and conduct research in the discipline of radiology. The student should also acquire basic knowledge in various sub-specialties of radiology.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment.”. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of “domains of learning” under the heading “competencies

Preamble

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

Program Outcomes

1. Graduate Attributes: Medical and Scientific Knowledge.

PO 1 :

- Demonstrate knowledge of normal and abnormal human structure, function and development from a molecular, cellular, biologic, clinical, behavioral and social perspective.
- Demonstrate knowledge about established and evolving biomedical and clinical sciences.
- Demonstrate knowledge of national and regional health care policies including the National Health Mission that incorporates National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM), frameworks, economics and systems that influence health promotion, health care delivery, disease prevention, effectiveness, responsiveness, quality and patient safety.

2. Graduate Attributes: Planning Patient Care and problem solving abilities

PO 2:

- Demonstrate ability to apply this knowledge to the practice of medicine in routine, emergency and disaster situations.
- Demonstrate ability to appraise and assimilate scientific evidence into their own ongoing learning, research, and patient care.
- Demonstrate ability to choose the appropriate diagnostic tests and interpret these tests based on scientific validity, cost effectiveness and clinical context
- Demonstrate ability to provide evidence-based care that is compassionate, respectful of patients' differences, values, and preferences.

3. Graduate Attributes: Professional excellence & Ethics

PO 3:

- Demonstrate commitment to the highest standards of professional responsibility towards patient, colleagues, society, growth of medical professional and adhere to universally accepted code of ethics.
- Demonstrate personal attributes of compassion, honesty, integrity, accountability, empathy in patient encounters.

4. Graduate Attributes: Communication Skills.

PO 4:

- Demonstrate ability to communicate effectively, respectfully, non-judgmental, empathetic manner with patients, their families and colleagues that will improve patient satisfaction ,health care and encourages participation and shared decision-making.
- Demonstrate the ability to listen clearly, inform, communicate and educate patients &/ caregivers for the promotion of health, diagnosis of disease and the treatment of illness; advocate for disease prevention, wellness and the promotion of healthy lifestyles including a focus on population health

5. Graduate attributes: Leader & Member of the health care team & System

PO 5:

- Demonstrate the ability to work effectively, efficiently & in rational way with his/ her colleagues and other team members, educate & motivate the team members in a manner to maximize the health delivery potential of the team, considering various roles, responsibilities and competencies of the other health professionals.
- Identify the self- potential, functioning ability as a team leader in primary and secondary health care settings, utilize various indicators of the health care system and to promote appropriate, low cost, ethical, fair and qualitative health delivery.

6. Graduate attributes: Life long learner

PO 6:

- Demonstrate ability to acquire new knowledge, skills and reflect upon their experience to enhance personal and professional growth and apply the information in the care of the patient.
- Demonstrate self-motivation and awareness to their own limitations.
- Demonstrate ability to introspect and utilize experiences, to enhance personal and professional growth and learning.

7. Graduate attributes: Research Aptitude

PO7:

- Demonstrate an attitude of inquiry/search/investigation ,scientific and objective effort to uncover facts.

8. Graduate attributes: Societal Responsibilities

PO8 :

- Demonstrate accountability in fulfilling their duty for the benefit of the entire society.

9. Graduate attributes: Awareness towards Environment and sustainability

PO9 :

- Demonstrates responsibility to conserve natural resources and protect global ecosystems to support health and wellbeing, now and in the future.

Course Outcome

CO1: To practice Radiodiagnosis ethically & legally keeping in mind the requirement of patient,community and people at large.

CO2: To demonstrate sufficient understanding of basic sciences related to Radiodiagnosis usingmannequins in Simulation Skill Lab and be able to integrate such knowledge in his Clinicalpractice.

CO3: To acquire in-depth knowledge in the subject including recent advances to be competent inconducting & interpreting various diagnostic / interventional imaging studies.

CO4: To acquire and be able to demonstrate his / her skills in performing various diagnostic &therapeutic procedures under image guidance.

CO5:To demonstrate competence in basic concepts of research methodology and writing thesis,research papers and publications by undergoing BCBR course training by UGC.

CO6: To develop good learning - teaching skills as well as communication and counselling skills.

PROGRAM SPECIFIC OUTCOMES :

At the end of the course, a Post Graduate student should be able to :

1. Acquire knowledge and skills to become a competent radiologist to conduct and interpret various diagnostic (including conventional, Ultrasound, Computed Tomography, PET-CT Mammography and Magnetic Resonance Imaging, etc.) / interventional studies & procedures keeping all safety features in mind.
2. Able to organize and conduct research (formulate basic research protocols and carry out research in the field of radiology - related clinical problems) and teaching activities (for undergraduates, post graduates as well as paramedical and technical personnel) and be well versed with medical ethics and legal aspects of imaging / intervention.
3. Provide competent radiological services in acute emergency and trauma including its medico-legal aspects.
4. Elicit indications, diagnostic features, limitation & safety features of applications of X-ray, ultrasonography, CT, Mammography, MRI & PET and should be able to describe proper cost- effective algorithm of various imaging techniques in a given problem setting.
5. Decide on various image-guided interventional procedures to be done for diagnosis and therapeutic management.
6. Able to decide on further specialization to be undertaken in any of the branches in Radiodiagnosis such as gastrointestinal radiology, uro-radiology, neuro-radiology, vascular radiology, musculoskeletal radiology, interventional radiology, etc.
7. Interact with other specialists and super-specialists so that maximum benefit accrues to the patient.
8. Should be able to organize CME activities in the specialty utilizing modern methods of teaching and evaluation.
9. Should be able to function as part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
10. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
11. Develop communication skills to word reports and professional opinion as well as to

SPECIFIC LEARNING OBJECTIVES

The objective of the program 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.

SUBJECT SPECIFIC COMPETENCIES

A. Cognitive Domain

A post graduate student on completing MD (Radiodiagnosis) should acquire knowledge in the following areas, and be able to:

1. Acquire good basic knowledge in the various sub-specialties of radiology such as chest radiology, neuro-radiology, GI-radiology, uro-radiology, cardio-vascular radiology, musculoskeletal, interventional radiology, emergency radiology, pediatric radiology and women's imaging.
2. Independently conduct and interpret all routine and special radiologic and imaging investigations.
3. provide radiological services in acute emergency and 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. Decide on the various image-guided interventional procedures to be done for diagnosis and therapeutic management.
6. Able to decide on further specialization to be undertaken in any of the branches in Radiodiagnosis such as gastrointestinal radiology, uro-radiology, neuro-radiology, vascular radiology, musculoskeletal radiology, interventional radiology etc.
7. Able to formulate basic research protocols and carry out research in the field of radiology- related clinical problems.
8. Acquire knowledge and teaching capabilities to work as a post graduate student /consultant in Radiodiagnosis and conduct teaching programs for undergraduates, post graduates as well as paramedical and technical personnel.
9. interact with other specialists and super-specialists so that maximum benefit accrues to the patient.
10. Should be able to organize CME activities in the specialty utilizing modern methods of teaching and evaluation.
11. Acquire knowledge to impart training in both conventional radiology and modern imaging techniques so that the post graduate student is fully competent to practice, teach and do research in the broad discipline of radiology including ultrasound, Computed Tomography and Magnetic Resonance Imaging.
12. Acquire knowledge of interventional radiology.

B. Affective Domain:

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor domain

Practical Training will include two major aspects:

- A. Interpretation of images, and
- B. Skill in performing a procedure.

A) Interpretation of images:

The student should be able to interpret images on all imaging modalities of diseases of following organs :

1. **Musculo-skeletal System** - Interpretation of diseases of muscles, soft tissue, bones and joints including congenital, inflammatory, traumatic, endocrine and metabolic, neoplastic and miscellaneous conditions.
2. **Respiratory System** - Interpretation of diseases of the chest wall, diaphragm, pleura and airway; pulmonary infections, pulmonary vasculature; pulmonary neoplasm; diffuse lung disease; mediastinal disease, chest trauma; post-operative lung and X-ray in intensive care.
3. **Cardiovascular System** - Interpretation of diseases and disorders of cardiovascular system (congenital and acquired conditions) and the role of imaging by conventional radiology, ultrasound, color Doppler, CT, MRI, Angiography and Isotopes Studies.
4. **Gastro-intestinal tract and hepato-biliary pancreatic system** - Interpretation of 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 liver, biliary system and pancreas.
5. **Urogenital System** - Interpretation of various diseases and disorders of genitourinary system. These include: congenital, inflammatory, traumatic, neoplastic, calculus disease and miscellaneous conditions.

6. **Central Nervous System (C.N.S.)** - Interpretation of diseases and disorders of the head, neck and spine covering, congenital, infective, vascular, traumatic neoplastic degeneration metabolic and miscellaneous condition.
7. Imaging in Emergency Medicine.
8. Imaging in Obstetrics and Gynecology.
9. Imaging of Breast and interventional procedures.
10. ENT, EYE and Dental Imaging.
11. Imaging of endocrine glands and those involved with metabolic diseases.
12. Clinical applied radionuclide imaging.
13. Interventional Radiology

B) Skills in performing a procedure

The student should be able to perform the following procedures:

1. **GIT contrast studies:** Barium studies (swallow, upper GI, Follow through, enema); fistulogram; sialogram; cologram/ileostogram,
2. **GU:** Excretory urography, MCU, RGU, nephrostogram, genitogram,
3. **Ultrasound:** Studies of whole body including neonatal transfontanelle studies, Doppler studies,
4. **CT scan:** should be able to position a patient, plan study as per the clinical indication, do reconstruction of images, perform triple phase study, perform & interpret advanced applications like CT enterography, CT angiography etc.
5. **MRI:** plan and perform MRI studies of whole body
6. **DSA:** should be able to describe the techniques, do (if available to student) transfemoral puncture and insert catheter, help in angiographic procedures both diagnostic and interventional.
7. **Radiography:** should be able to independently do radiography of common and some important uncommon views of different body parts. This includes positioning, centering of X ray beam, setting of exposure parameters, exposing and developing the films. The student should be familiar with not only conventional radiography but with CR and DR systems.
8. **Interventional radiology:** The student should be able to perform simple, common non-vascular procedures under ultrasound and fluoroscopy guidance e.g. abscess drainage, drainage catheter placement, nephrostomy, biliary drainage etc. The student should have knowledge of common vascular interventions e.g. stricture dilatation using balloon catheters, embolization with gel foam and other agents, names of common catheters, handling of intravenous contrast reactions; techniques, indications and contraindications for various procedures;

Syllabus

Course contents:

Anatomy

Gross and cross sectional anatomy of all the body systems.

Pathology

Gross morphology of pathological conditions of systemic diseases affecting all organ systems.

Radiology Course

This would cover imaging and interventions of diseases affecting all the body systems:

- Chest
- Cardiovascular system
- Musculoskeletal including soft tissue
- Gastrointestinal system
- Hepato-biliary-pancreatic system
- Urogenital (genito-urinary) system
- CNS including head and neck
- Obstetrics and gynaecology
- ENT, eye, dental, breast
- Endocrine and metabolic system
- Clinically applied radionuclide imaging

Radiological Physics

1. Introduction of general properties of radiation and matter: Fundamentals of nuclear physics and radioactivity
2. Interaction of x-rays and gamma rays with matter and their effects on irradiated materials
3. X-ray Generating Apparatus
4. Screen-film radiography
5. Film processing: Dark room, dry processing, laser /dry chemistry cameras, artifacts.
6. Fluoroscopy: Digital including flat panel units, fluoroscopy cum radiography units
7. Digital radiography: Computed Radiography, Flat panel radiography
8. Other equipment: Ultrasound including Doppler, CT, MRI and DSA
9. Contrast Media (Iodinated, MR & Ultrasound) - types, chemical composition, mechanism of action, dose schedule, route of administration, adverse reaction and their management.

10. Nuclear Medicine: Equipment and isotopes in various organ systems and recent Advances
11. Picture Archiving and Communication System (PACS) and Radiology Information System (RIS) to make a film-less department and for Teleradiology
12. Radiation protection, dosimetry and radiation biology
13. Image quality and Quality Assurance (QA)
14. Recent advances in radiology and imaging

The student should have knowledge of the following physics experiments:

- Check accuracy of kVp and timer of an X ray unit
- Check accuracy of congruence of optical radiation field
- Check perpendicularity of x ray beam
- Determine focal spot size
- Check linearity of timer of x ray unit
- Check linearity of mA
- Verification of inverse square law for radiation
- Check film screen contact
- Check film screen resolution
- Determine total filtration of an x ray unit
- Processor quality assurance test
- Radiological protection survey of an x ray unit
- Check compatibility of safe light
- Check performance of view box
- Effect of kVp on x ray output

Radiography and processing techniques

1. Processing techniques: includes dark room and dry processing.
2. Radiography of the musculo-skeletal system including extremities.
3. Radiography of the chest, spine, abdomen and pelvic girdle.
4. Radiography of the skull, orbit, sinuses.
5. Contrast techniques and interpretation of GI tract, hepato-biliary tract, pancreas etc.
6. Contrast techniques and interpretation of the Central Nervous system.
7. Contrast techniques and interpretation of the cardiovascular system including chest.
8. Contrast techniques and interpretation of the genito - urinary system including
9. Obstetrics and Gynaecology.
10. Paediatric radiology including MCU, genitogram, bone age.
11. Dental, portable and emergency (casualty) radiography.

TEACHING AND LEARNING METHODS

The training is spread over 3 years and includes following components:

1. Physics related to imaging
2. Rotational posting in various sub-specialties.
3. Seminars, case discussion, journal club.
4. Research methodology and statistics.
5. A log book should be maintained by the student and will be checked and signed regularly by the faculty-in-charge during the training program.
6. The postgraduate students shall be required to participate in the teaching and training program of undergraduate students and interns.
7. The postgraduate student would be required to present one poster presentation, to read one paper at a national/state conference and to submit one research paper which should be published or accepted for publication or sent for publication to a peer reviewed journal, during the period of his/her postgraduate studies so as to make him/her eligible to appear at the postgraduate degree examination.
8. Department should encourage e-learning activities.

Rotations:

During the three-year course, suggested rotations are as follows:-

1. Conventional chest, abdomen, musculoskeletal including 8 months skull, spine, PNS and mammography etc
2. Contrast studies: G.U., GIT, Hepato-biliary, 8 months angiography etc including fluoroscopic guided Interventions
3. US, Doppler and US guided interventions 8 Months
4. CT and CT guided interventions 6 Months
5. Emergency radiology 2 Months
6. M.R.I. 2 Month
7. Elective posting 2 Months During each posting, post graduate student should be able to perform the procedures and interpret the findings.

PROPOSED SCHEDULE FOR ROTATION

1 ST Year (1/6)	Conventional Chest & abdomen	Conventional skull, spine, musculoskeletal etc.	US	Contrast studies - GIT & other fluoroscopic investigations	Contrast studies - G.U. tract	US
(2/6)	US & interventions	Conventional skull, spine, musculoskeletal etc	CT	Contrast studies -- GIT & other fluoroscopic investigations	Contrast studies - G.U. tract	US & interventions
2 nd Year (3/6)	Conventional Chest & abdomen	Contrast studies - GIT & other fluoroscopic investigations including angiography	Contrast studies -G.U. tract	US & interventions	Emergency	CT
(4/6)	Conventional skull, spine, musculoskeletal etc.	Contrast studies - G.U. tract including pediatric MCU/genitogram	US & interventions	US & Doppler	Emergency	MRI
3 rd year (5/6)	Conventional Chest & mammography	Contrast studies - GIT & other fluoroscopic investigations including angiography	US & Doppler	Emergency	CT & interventions	Elective
(6/6)	Conventional musculoskeletal & mammography	Contrast studies - G.U. tract including pediatric MCU/genitogram	CT& interventions	CT & interventions	MRI	Elective

During the training program, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently. For this purpose, provision of skills laboratories in medical colleges is mandatory.

POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.

Postgraduate Examination

The Post Graduate Examination will be conducted in three parts.

1. Thesis:

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognized Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis (Dissertation). Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

- a. A postgraduate student of a MD Radiodiagnosis degree course would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.**

ASSESSMENT :

Summative Assessment / University exams

Scheme of examination :

A) Theory : Total 400 marks

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:

Passing criteria- for theory minimum of 40% marks in each paper and an aggregate of 50% in all papers.

Minimum 50% in practicals. Separate passing is required in Theory and Practical.

Paper I - Basic sciences related to Radiology (consists of Anatomy, Pathology. Basic and Radiation Physics, Imaging Techniques, and Film processing).

Paper II- Chest, CVS. CNS including Head & Neck Eye, ENT Musculo-skeletal. paediatric radiology and Mammography.

Paper III- Abdominal Imaging including GI. GU, Hepatobiliary, endocrine and metabolic. Obstetrics and Gynaecology and Interventional radiology

Paper IV- Recent advances, nuclear medicine; Radiology related to clinical Specialties

NOTE: The distribution of chapters/topics shown against the papers are suggestive only and may overlap or Change.

B) Practical exams. Total 400 marks

- A. Long Case (One) = 100 Marks
- B. Short Cases (Two) = 100 Marks (50x2)
- C. Spotters (Twenty five / Fifty) = 50 Marks
- D. Performing USG study = 25 Marks
- E. Pedagogy (Thesis evaluation, Log books, Publications) = 25 Marks
- F. Grand Viva = 100 marks

All examiners will conduct practical examination conjointly on candidate's 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 but not restricted to the following heads:

- Radiation Physics and quality assurance
- Implements. Catheters and contrast
- Cassettes films, dark room, equipment
- Radiographic techniques, Radio logical procedures,
- Gross pathology.

Formative assessment:

Internal Assessment will cover all domains of learning.

So also it with evaluate professionalism and communication skills of the candidate.

Internal Assessment will be conducted in theory and practical/clinical examination.

Postgraduate Students Appraisal Form:

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. no	PARTICULARS	NOT SATISFACTORY			SATISFACTORY			MORE THAN SATISFACTORY			REMARKS
		1	2	3	4	5	6	7	8	9	
1	Journal based / recent advances learning										
2	Patient based/ laboratory or skill based learning										
3	Self directed learning and teaching										
4	Departmental and inter departmental learning activity										
5	External and outreach activities/ CME										
6	Thesis / research work										
7	Log book maintenance										

Publications**Yes/ No****Remarks***

***REMARKS:** Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE**SIGNATURE OF CONSULTANT****SIGNATURE OF HOD**



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