SRI BALAJI VIDYAPEETH

(Deemed – to be - University u/s 3of UGC Act, 1956)

Pillaiyarkuppam, Puducherry - 607 402

Mahatma Gandhi Medical College and Research Institute

Shri Sathya Sai Medical College and Research Institute

COMPETENCY BASED POSTGRADUATE MEDICAL CURRICULUM
M.D. RADIO DIAGNOSIS
(2020 Onwards)

(As approved at the 30th Academic Council Meeting held on 28th September 2020)

Preface

Following the promulgation of the much awaited Competency Based Medical Education (CBME) for post graduate by the Medical Council of India (MCI) (superseded by the Board of Governors), adoption of CBME for implementing post-graduate programs is a welcome move. Sri Balaji Vidyapeeth (SBV), Puducherry, Deemed to be University, declared u/s 3 of the UGC Act. and accredited by the NAAC with A grade, takes immense privilege in preparing such an unique document in a comprehensive manner and most importantly the onus is on the Indian setting for the first time, with regard to the Competency Based Medical Education for post graduate programs that are being offered in the broad specialty departments. SBV is committed to making cardinal contributions that would be realised by exploring newer vistas. Thus, post graduate medical education in the country could be made to scale greater heights and SBV is poised to show the way in this direction.

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Preface

Following roll out of much awaited Competency-Based Medical Education (CBME) for undergraduate by the Medical Council of India (MCI)(superseded by the Board of Governors) , adoption of CBME for post-graduate by it is welcome move.

The MCI has laid down the syllabus course wise, listing competency to some extent, teaching learning methods and the assessment methods as well. The MCI describes competencies in three domains (knowledge, skill, and attitude). However, the most significant problem in competency-based training is the development of appropriate assessment tools.

The salient feature of this document is defining the program educational objectives (PEO) for its postgraduate program as a whole, defining program outcomes (PO) based on the competencies to be practiced by the specialist, course outcomes (CO) and program specific sub-competencies and their progression in the form of milestones. The compilation of the milestone description leads to the formation of the required syllabus. This allows the mentors to monitor the progress in sub-competency milestone levels. It also defines milestone in five levels, for each sub-competency. Although MCI has described three domains of competencies, the domain 'Attitude' is elaborated into 4 more competencies for ease of assessment. The six competency model (ACGME) for residency education: Medical Knowledge, Patient Care, Practice Based Learning and Improvement, Systems Based Practice, Professionalism, Inter personal and Communication Skills gives better clarity and in-depth explanation. The sub-competency and their milestone levels are mapped into the entrustable professional activities (EPA) that are specific to the individual postgraduate program. To make the program more relevant, PEO, PO, CO and EPAs are mapped with each other. EPA's which are activity based are used for formative assessment and graded. EPA assessment is based on workplace based assessment (WPBA), multisource feedback (MSF) and e-portfolio. A great emphasis is given on monitoring the progress in acquisition of knowledge, skill and attitude through various appraisal forms including e-portfolios during three years of residency period.

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Foreword

Education as Bruner reminds us is a complex pursuit of fitting a culture to the needs of its members and of fitting its members and their ways of knowing to the needs of the culture.

Keeping this in mind, We have designed the present postgraduate radiology curriculum.

The purpose of this curriculum is to meet patient and service need by ensuring that the residents develop the specific capabilities necessary to become a consultant radiologist ,alongside the necessary generic professional capabilities expected of all doctors.

The curriculum provides a training framework, describing a standard required to achieve the post graduate degree. This curriculum will be competency based, where the students are assessed on six competencies considered essential for a medical professional. The student's academic milestones will be periodically recorded based on the level of competency attained. We attempt to broaden our assessment protocol by including multisource feedback, and workplace assessment by faculty in addition to the theoretical exams.

The programme has been streamlined and properly repositioned to keep producing competent radiologists who are capable of fitting into the future roles of radiology in healthcare delivery.

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We also like to acknowledge and thank our external experts who gave their valuable opinion about our updated PG Curriculum External Experts

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This document named postgraduate curriculum for the **M.D. POST GRADUATES** has been prepared in the accordance with the document notified by Board of Governors in suppression of MCI https://www.mciindia.org/CMS/information-desk/for-colleges/pg-curricula-2. This document has been prepared by the Department of Radio diagnosis of MGMCRI, Puducherry,ratified by the Board of Studies on 11.05.2020and approved by Academic Council of Sri Balaji Vidyapeeth, a deemed to be university, accredited 'A' Grade by NAAC.

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1. 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. The purpose of MD Radiodiagnosisis to standardize radiodiagnosis 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 radiologist with appropriate expertise. The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by subject-content specialists. The Reconciliation Board of Academic Council has attempted to render uniformity without compromise to purpose and content of the document. 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"..

2. Program Educational Objectives (PEO)

PEO1 **:** Specialist who can provide Accurate reporting and care in imaging services

PEO2 **:** To be an advanced Leader in the profession and team member who understands health care system and act to provide safe patient care with accountability and responsibility.

PEO3 **:** Communicator and possessing adequate communication skill to convey required information in an appropriate manner in various health care setting

PEO4 **:** Lifelong learner keen on updating oneself regarding the advancement in the health care field and able to perform the role of researcher and teacher

PEO5 **:** Professional who understands and follows the principle of bioethics related to health care system

3. Program Outcome (PO)

After three years of residency program postgraduate should be able to

PO1 **:** Demonstrate knowledge of radiological physics.(C1)

PO2 **:** Become a skilled and competent radiologist to conduct and interpret various diagnostic/ interventional imaging studies in various subspecialties of radiology(C2,C3 &C4)

PO3 **:** Demonstrate radiation safety for self, staff, and patients as set forth by the ALARA standards.(C1)

PO4 **:** Demonstrate effective critical thinking and problem solving skills. (C2,C3,C4)

PO5 **:** Demonstrate effective patient care skills. (C2,C3,C4)

PO6 **:** Demonstrate teamwork while conducting patient procedures. (C2,C3,C4) **PO7**.Identify the needs of the patient and society to provide cost effective care. (C2,C3,C4) **PO8**.Utilize both written and oral communication effectively. (C2,C3,C4)

PO9 **:** Informed consent while performing a procedure. (C2,C3,C4)

PO10 **:** Demonstrate an understanding of advanced imaging modalities and the need for lifelong learning.(C4)

PO11 **:** Demonstrate an understanding of basic research protocols and carry out research in the

field of radiology related clinical problems (C1,C2,C3 &C4)

PO12 : Demonstrate professional conduct and ethical decision making.(C2,C3,C4)

4. Course and Course Objectives (CO)

4.1 Course 1 (C1)-Radiological physics with basic medical science -MK1, MK2, MK3,& MK7

Objectives: At the end of three years postgraduates

CO1 : Should have adequate knowledge about Gross and cross sectional anatomy of all the body systems.

CO2 : Should have sound knowledge about Gross morphology of pathological conditions of systemic diseases affecting all organ systems.

CO3 : Should be able to apply knowledge of preclinical and paraclinical sciences in imaging of the body

CO4 : Should have adequate knowledge of medical radiation physics, imaging techniques, contrastmedia, radiation safety and be able to apply them in clinicalpractice.

4.2 Course 2 (C2)-Chest, CVS,CNS including Head & Neck, Eye, ENT, Musculoskeletal, pediatric radiology and mammography- MK 2-7, PC 1-6, ICS 1-3, SBP 1-4, PBL1-3, P1-3.

Objectives : At the end of three years postgraduates

CO5 : Should Acquire adequate knowledge in imaging of Chest, CVS, CNS, Head & Neck, orbit,ENT, Musculoskeletal, pediatric radiology and mammography

CO6 : Should be able to Independently conduct and interpret all routine and special radiologic imaging investigations pertaining to subspecialties of Chest, CVS, CNS including Head & Neck, Eye, ENT, Musculoskeletal, pediatric radiology and mammography

CO7 : Elicit indications, diagnostic features and limitations of applications of USG,CT and MRI and should be able to describe proper cost effective algorithm of various imaging technique pertaining to subspecialties of Chest, CVS,CNS including Head & Neck, Eye, ENT, Musculoskeletal, pediatric radiology and mammography.

CO8 : Provide radiological services in acute emergency and trauma including Head & Neck, Eye medico legal aspects pertaining to subspecialties of Chest, CVS,CNS including, ENT, Musculoskeletal, pediatric radiology and mammography

4.3 Course(C3)-Abdominal Imaging including GI, GU, Hepatobiliary, endocrine and metabolic, Obstetrics and Gynecology and interventional radiology-MK 2-7,PC 1-6,ICS 1-3,SBP 1- 6,PBL 1-3,P1-3.

CO9 : Should Acquire adequate knowledge in imaging of GI, GU,Hepatobiliary, endocrine and metabolic, Obstetrics and Gynecology

CO10 : Should be able to Independently conduct and interpret routine and special radiologic imaging investigations pertaining to subspecialties of GI, GU, Hepatobiliary, endocrine and metabolic, Obstetrics and Gynecology

CO11 : Acquire knowledge of interventional radiology And Able decide on various image guided interventional procedures to be done for diagnosis and therapeutic management

CO12 : Elicit indications, diagnostic features and limitations of applications of USG, CT and MRI and should be able to describe proper cost effective algorithm of various imaging techniques pertaining to subspecialties of GI, GU, Hepatobiliary, endocrine and metabolic, Obstetrics & Gynecology

CO13 : Provide radiological services in acute emergency and trauma including medicolegal aspects pertaining to tosubspecialitiesof GI, GU, Hepatobiliary, endocrine & metabolic, Obs & Gynaecology

4.4 Course 4 (C4)-Recent Advances, Nuclear medicine and radiology related to clinical specialities including oncologic imaging, -MK 2-7, PC 1-6, ICS 1-3, SBP 1-4, PBL 1-3, P 1-3.

CO14 : Recent advances/ techniques used in MRI using ultrafast sequences and knowledgeon special sequences for specific pathologies.

CO15 : Interpret recent advances in MR imaging including CSF flow studies, functional imaging, diffusion tensor imaging, cardiac MRI, fetal MRI and dynamic imaging studies

CO16 : Learn advanced Ultrasound techniques like CEUS, 3D USG and their clinical applications

CO17 : Learn the basic principles of nuclear medicine-radiopharmaceutical imaging and be familiar with the description of relevant findings and appropriate interpretation & to understand the principles of hybrid imaging

The PEO, PO and the CO are mapped with each other.**(Table 1)**

Table1. Mapping of PEO, PO and CO

	PEO 1					**PEO2**		**PEO3**		**PEO 4**		**PEO 5**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C1	Y		Y								Y	
C2		Y		Y	Y	Y	Y	Y	Y		Y	Y
C3		Y		Y	Y	Y	Y	Y	Y		Y	Y
C4		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y

All courses run concurrently for 3 years with a summative assessment at the end of 3 years. The program is competency based and the competencies, sub-competencies and milestones are detailed. These are

mapped to the Entrustable professional activities (EPA) identified as essential for a specialist.Formative assessment is carried out every three months using appropriate tools, for identifying eligibility for transfer of trust.

5. Competencies, Sub-competencies and Milestone

At the end of the Post graduates in Radiology , the student should have acquired various competencies i.e. medical knowledge, patient care, interpersonal communication skill, system based practice, practice based learning and implementation and professionalism.

Details of each with milestone as level is described below. (Table 2)

Table 2. Description of Competencies, Sub-competencies and Milestone

Medical Knowledge

Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care. Residents must demonstrate proficiency in their knowledge of

Table 2. Description of Competencies, Sub-competencies and Milestone

Medical Knowledge

Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care. Residents must demonstrate proficiency in their knowledge of:

MK 1. Knowledge of medical physics, instrumentation and contrast media and other pharmacologic agents used in imaging

Level 1	Level 2	Level 3	Level 4	Level 5
Discusses the basic physics for diagnostic radiology	Demonstrates knowledge of basic medical physics and radiobiology in diagnostic radiology	Applies knowledge of basic medical physics and radiobiology to imaging	Applies physical principles to optimize image quality, including dose reduction strategies	Teaches physical principles to optimize image quality to other specialties
Has basic knowledgeof instrumentation	Understands basic image acquisition and image processing,and recognizescommon imaging artifacts and technical problems	Demonstrates knowledge of instrument quality control and image reconstruction	Works with technologist to optimize image acquisition and processing	Presents orpublishes instrumentation research in peer- reviewedmedia
Demonstrates basic knowledge of the pharmacologic agents used in radiology	Demonstrates knowledge of dosing and drug choice for sedation and other commonly used pharmacologic agents	Demonstrates knowledge of the indications, contraindications, side-effects, and complications of pharmacologic agents	Applies functional knowledge of pharmacology to radiology procedures and peri-procedural care	Develops pharmacologic protocols or departmental guidelines

MK 2. Knowledge of gross, cross sectional anatomy of all body system.

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of imaging anatomy	Applies knowledge of anatomy to make common imaging diagnoses	Applies knowledge of anatomy to make uncommon imaging diagnoses	Proficiently integrates knowledge of anatomic and molecular imaging with pathophysiology to formulate a diagnosis	Proficiently integrates knowledge of anatomic and molecular imaging with pathophysiology to formulate a diagnosis at the expected level of a subspecialist

MK 3. Knowledge of basic pre & para clinical science in imaging whole body.Knowledge of Physiology & Patho physiology in imaging whole body.

Level 1	Level 2	Level 3	Level 4	Level 5
Has a basic fund of knowledge regarding anatomy, physiology, and pathophysiology of common diseases	Understands imaging findings based on knowledge of anatomy, physiology, and pathophysiology of common diseases	Understands imaging findings based on knowledge of anatomy, physiology, and pathophysiology of less common diseases	Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	Advances knowledge of anatomy, physiology, and/or pathophysiology of diseases by production of original scientific work

MK 4. Protocol selection & optimization of images tailored for each case.

Hasnot Achieved Level 1	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
	Selects appropriate protocol and contrast agent/dose for basic imaging, including protocols encountered during independent call Recognizes sub-optimal imaging	Selects appropriate protocols and contrast agent/dose for intermediate imaging	Selects appropriate protocols and contrast agent/dose for advanced imaging Demonstrates knowledge of physical principles to optimize image quality	Independently modifies protocols as determined by clinical circumstances Applies physical principles to optimize image quality	Teaches and/or writes imaging protocols

MK 5. Imaging technology & image acquisition.

Level 1	Level 2	Level 3	Level 4	Level 5
Discusses imaging technology and image acquisition	Demonstrates knowledge of basic image acquisition and image processing, and recognizes common imaging artifacts and technical problems	Demonstrates knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction	Proficiently optimizes image acquisition and processing in collaboration with the technology/imaging team	Presents or publishes research on imaging Technology

MK 6. Interpretation of examinations.

Has not Achieved Level 1	Level 1	Level 2	Level 3	Level 4	Level 5
	Makes core observations, formulates differential diagnoses, and recognizes critical findings. Differentiates normal from abnormal.	Makes secondary observations, narrows the differential diagnosis, and describes management options.	Provides accurate, focused, and efficient interpretations Prioritizes differential diagnoses and recommends management.	Makes subtle observations. Suggests a single diagnosis when appropriate. Integrates current research and literature with guidelines to recommend Management.	Demonstrates expertise and efficiency at a level expected of a subspecialist. Advances the art and science of image interpretation.

MK 7. Knowledge of Radiation safety.

Level 1	Level 2	Level 3	Level 4	Level 5
Knows basic radiation protection conceptsand basic procedural	Understandsradiation protection concepts correlativeimaging Understandsappropriate use of “time-out” procedure Knows how to ensure that the right patienthas the right study at the right time in theright setting	Uniformly practices ALARA principles for patients, family, staff, andpublic Knows more complex concepts of procedural safety and contraindications	Understands prevention of procedural complications in imagingstudies Knows how to manage proceduralcomplications	Demonstrates excellent understanding of radiation protection and/ or proceduralsafety Implements newsafety procedures and quality control measures impacting patientcare

Patient care

Patient Care Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.

Residents must demonstrate proficiency in:

PC 1.Applying best scientific evidence to the care of patients (evidence-based medicine)

Hasnot Achieved Level 1	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
	Uses established evidence- based imaging guidelines such as American College of Radiology (ACR) Appropriateness Criteria. Appropriately uses the Electronic Health Record to obtain relevant clinical information	Recommends appropriate imaging of common conditions independently	Recommends appropriate imaging of uncommon conditions independently	Integrates current research and literature with guidelines, taking into consideration cost effectiveness and risk-benefit analysis, to recommend imaging	Participates in research, development, and implementation of imaging guidelines

PC 2. Competence in performing diagnostic/interventions procedures.

Hasnot Achieved Level 1	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
	Competently performs basic Procedures under indirect supervision Recognizes and manages complications of basic procedures	Competently performs intermediate procedures, Recognizes and manages complications of intermediate procedures	Competently performs advanced procedures, Recognizes and manages complications of advanced procedures	Able to competently and independently perform the following procedures: • adult and pediatric fluorostudies • lumbarpuncture • image-guidedvenous and arterialaccess • hands-on adult and pediatricultrasound studies • drainage of effusions andabscesses • image-guidedbiopsy • nuclear medicine I-131 treatments (≤33 and > 33 mCi)	Able to teach procedures to junior-level residents Competently performs complex procedures, modifies procedures as needed, and anticipates and manages complications of complex procedures

PC 3. Patient Safety: contrast agents, Radiation safety &MR safety sedation.

Has not Achieved Level 1	Level 1	Level 2	LEVEL 3	LEVEL 4	LEVEL 5
	Contrast Agents: Recognizes and manages contrast reactions **Radiation Safety:** Describes the mechanisms of radiation injury and the ALARA (“as low as reasonably achievable”) concept **MR Safety:** Describes risks of MRI	**Contrast Agents:** Re-demonstrates recognition and management of contrast reactions **Radiation Safety:** Accesses resources to determine exam-specific average radiation dose information **MR Safety:** Accesses resources to determine the safety of implanted devices and retained metal	**Contrast Agents:** Re-demonstrates recognition and management of contrast reactions **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners	**Contrast Agents:** Re-demonstrates recognition and management of contrast reactions **Radiation Safety:** Applies principles of Image Gently and Image Wisely **MR Safety:** Applies principles ofMR safety including safety zones and pre-MR screening **Sedation**: Describes the principles of conscious sedation	**Contrast Agents:** Teaches appropriate treatment of contrast reactions **Radiation Safety:** Promotes radiation safety **MR Safety:** Participates in establishing or directing a safe MR program **Sedation**: Selects appropriate sedation agent and dose for conscious sedation

PC4. Competency in procedural radiation safety.

Level 1	Level 2	Level 3	Level 4	Level 5
Wears dosimeter at all times Discusses principles of radiation dose reduction, including the programs Image Gently® and Image Wisely® Is Basic Cardiac Life Support (BCLS)-certified	Uses intermittent fluoroscopy during procedures Uses radiation protection devices as appropriate Is Advanced Cardiovascular Life Support (ACLS)-certified	Uses magnification appropriately and judiciously Modifies the fluoroscopy rate during procedures	Minimizes dose to the patient with appropriate collimation and filters Optimizes exposure parameters based upon the individual patient and procedure Counsels and monitors patients, as appropriate, regarding radiation exposure	Serves on an institutional or national committee to write protocols and/ or monitor radiation exposure

PC5. Competency in non procedural case / consultation & follow up.

Level 1	Level 2	Level 3	Level 4	Level 5
• Performs a comprehensive history and physical examination • Formulates a pre-procedural assessment and plan with routine assistance from a faculty member • Obtains informed consent for basic procedures	• Performs a focused history and physical examination • Formulates a pre-procedural assessment and plan with minimal assistance from a faculty member • Obtains informed consent for more complex procedures	• Chooses appropriate peri-procedural laboratory and imaging studies • Independently formulates a pre- procedural assessment and plan for common disorders	• Adjusts procedural plan based upon peri- procedural laboratory and imaging results • Independently formulates a pre- procedural assessment and plan for less common disorders	• Independentl y supervises junior learners in the clinical setting

• Performs routine post-procedural care with assistance from a faculty • member	• Performs routine post-procedural care with minimal assistance from a faculty member	• Independently formulates and implements a post-procedural care plan for uncomplicated procedures	• Independently formulates and implements a post-procedural care plan for complicated/complex procedures	• Develops patient care protocols/tea ching material

PC 6. Competency in reporting images.

Level 1	Level 2	Level 3	Level 4	Level 5
• Generates reports with appropriate elements for coding • Describes lexicons and structured reporting	• Efficiently generates clear and concise reports that do not require substantive correction • Uses lexicons and structured reporting that do not require substantive correction	• Efficiently generates clear and concise reports that rarely requirecorrection • Uses lexicons and structured reporting that rarely requirecorrection	• Generates tailored reports meeting the needs of the care provider and complex interventional reports with appropriate elements for coding • Proficiently uses lexicons and structured reporting to provide accurate and timely reports that do not • require correction	• Generates tailored reports meeting the referring subspecialty needs

Interpersonal and Communication Skills

Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals. Residents must:

ICS 1. Effective Communicate with patients, families, and caregivers.

Has not Achieved Level 1	Level 1	Level 2	Level 3	Level 4	Level 5
	Communicates information about imaging and examination results in routine, uncomplicated circumstances Obtains informed consent	Communicates, under direct supervision, in challenging circumstances (e.g., cognitive impairment, cultural differences, language barriers, low health literacy) Communicates, under direct supervision, difficult information such as errors, complications, adverse events, and bad news	Communicates, under indirect supervision, in challenging circumstances (e.g., cognitive impairment, cultural differences, language barriers, low health literacy)	Communicates complex and difficult information, such as errors, complications, adverse events, and bad news	Serves as a role model for effective and compassionate communication Develops patient-centered educational materials

ICS 2. Effective Communication with members of health care team with colleagues within specialty, other health professionals.

Has not Achieved Level 1	Level 1	Level 2	LEVEL 3	LEVEL 4	LEVEL 5
	Adheres to transfer-of-care policies **Written/Electronic:** Generates accurate reports with appropriate elements required for coding	**Written/Electronic:** Efficiently generates clear and concise reports that do not require substantive faculty member correction on routine cases	**Written/ Electronic:** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases	**Written/ Electronic:** Efficiently generates clear and concise reports that do not require substantive faculty member correction on all cases	Leads interdisciplinary conferences **Written/ Electronic:** Generates tailored reports meeting needs of referring physician

	Verbal: Communicates urgent and unexpected findings according to institutional policy	**Verbal:** Communicates findings and recommendations clearly and concisely	**Verbal:** Communicates appropriately under stressful situations	**Verbal:** Communicates effectively and professionally in all circumstances	Develops templates and report formats **Verbal:** Serves as a role model for effective communication

ICS 3. Effective teaching.

Level 1	Level 2	Level 3	Level 4	Level 5
Is able to generate effective teaching presentations Participates in teaching and interdisciplinary conferences	Under direct faculty member supervision, prepares for departmental and/or interdisciplinary teaching conferences	With minimal faculty member supervision, prepares for departmental and/or interdisciplinary teaching conferences Presents a formal lecture to junior learners for review and critique	Independently leads a departmental and/or interdisciplinary teaching conference Effectively teaches junior learners at the view box	Present educational material at a hospital or at a regional or national meeting Effectively teaches junior learners procedural skills

Systems-based Practice

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents must:

SBP.1. Quality improvement.

Has not Achieved Level 1	Level 1	Level 2	LEVEL 3	LEVEL 4	LEVEL 5
	Describes departmental QI initiatives Describes the departmental incident/occurrence reporting system	Incorporates QI into clinical practice Participates in the departmental incident/ occurrence reporting system	Identifies and begins a systems-based practice project incorporating QI methodology	Completes a systems-based practice project. Describes national radiology quality programs (e.g., National Radiology Data Registry, accreditation, peer-review)	Leads a team in the design and implementation of a QI project Routinely participates in root cause analysis

SBP.2. Health care economics.

Has not Achieved Level 1	Level 1	Level 2	LEVEL 3	LEVEL 4	LEVEL 5
	Describes the mechanisms for reimbursement, including types of payors	States relative cost of common procedures	Describes the technicaland professional components of imagingcosts	Describes measurements of productivity	Describes the radiology revenue cycle

SBP.3. Multidisciplinary conferences.

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates basic knowledge of how a multidisciplinary conference operates	Attends multidisciplinary conferences	Contributes meaningfully to the multidisciplinary conference	Initiates and presents their own patients at multidisciplinary conference, and is responsible for comprehensive discussion	Leads a multidisciplinary conferences

SBP.4. Population health
Consider cost &risk benefit analysis in population - based care as appropriate.

Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates knowledge of population and community health needs and disparities	Identifies specific population and community health needs and inequities for their local population	Uses local resources effectively to meet the needs of a patient population and community	Participates in changing and adapting practice to provide for the needs of specific populations	Leads innovations and advocates for populations and communities with health care inequities

Practice-based Learning and Improvement

Residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning.

PBLI 1. Self learning and improvement.
Identify strengths, weakness, and limits of one's knowledge and skill.

Has not Achieved Level 1	Level 1	Level 2	LEVEL 3	LEVEL 4	LEVEL 5
	Develops an annual learning plan based onself-reflection and programfeed back	Evaluates and modifies learning plan	Evaluates and modifies learning plan	Evaluates and modifies learning plan	Advocates for lifelong learning at local and national levels

PBLI 2. Scholarly activity.

Has not Achieved Level 1	Level 1	Level 2	LEVEL 3	LEVEL 4	LEVEL 5
	Documents training in critical thinking skills and research design	Works with faculty mentors to identify potential scholarly projects	Begins scholarly project	Completes and presents a scholarly project	Independently conducts research and contributes to the scientific literature and/or completes more than one scholarly project

PBLI 3. Reflective practice & commitment to personal growth.

Level 1	Level 2	Level 3	Level 4	Level 5
Accepts responsibility for professional development by establishing goals Identifies factors which contribute to gap(s) between expectations and actual performance Actively seeks opportunities to improve performance	Receptive to performance data and feedback in order to adjust goals Analyzes and reflects on factors which contribute to gap(s) between expectations and actual performance Designs and implements a learning plan, with prompting	Episodically seeks performance data and feedback, with humility and adaptability Analyzes, reflects on, and institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance Designs and implements a learning plan independently	Consistently seeks performance data and feedback with humility and adaptability Analyzes effectiveness of behavioral changes where appropriate and considers alternatives in narrowing the gap(s) between expectations and actual performance Uses performance data to measure the effectiveness of the learning plan and when necessary, improves it	Coaches other learners to consistently seek performance data and feedback Coaches others on reflective practice Facilitates the design and implements learning plans for others

Professionalism

Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Residents must demonstrate:

P 1. Professional values & ethics at individual level.

Level 1	Level 2	Level 3	Level 4
Is an effective health care team member, promoting primacy of patient welfare, patient autonomy, and social justice Demonstrates the following professional behaviors: • is truthful • recognizes personal limitations and seeks help when appropriate	Actively reflects on personal professional behavior and discusses professionalism issues as identified in Level 1 with students and residents	Is an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice	Serves as a role model for professional behavior as identified in Level 1

• recognizes personal impairment and seeks help whenneeded • responds appropriately to constructive criticism • places needs of patients beforeself • maintains appropriate boundaries with patients, colleagues, andothers • exhibits tolerance and acceptance of diverse individuals and groups			

P 2. Professionalism in health care system.

Level 1	Level 2	Level 3	Level 4	Level 5
Is an effective health care team member that demonstrates the following professional behaviors: recognizes the importance and priority of patient care and advocates for patient interests fulfills work-related responsibilities maintains patient confidentiality fulfills Institutional and Program Requirements related to professionalism andethics prepares for andattends required conferences	Recognizes opportunities to improve professionalism in the workplace, and takes part in programs to improve clinical care and professional behavior as identified in Level 1	Is an effective health care team leader, promoting departmental and institutional goals regarding primacy of patient welfare, patient autonomy, and social justice	Serves as a role model for professional behavior as identified in Level 1	Accepts leadership roles in institutional regional and national organizations to advance professionalism

P 3. Professionalism in administrative tasks.

Level 1	Level 2	Level 3	Level 4	Level 5
Completes procedure log, performs other assigned and required administrative tasks in a timely fashion, and does not require excessive reminders or follow-up Complies with duty hour regulations and accurately reports duty hours	Promptly attends and participates in conferences, meetings, and other service and educational activities Responds promptly to requests from faculty and departmental staff members	Acts as a role model for conference attendance, promptness, and attention to assigned tasks Prepares materials and presents at assigned morbidity and mortality and other conferences	Ensures that others under his or her supervision respond appropriately to responsibilities in a timely fashion	Participates in the development or revision of administrative responsibilities

6. Syllabus

Course 1 Applied basic medical science:

SYLLABUS FOR PAPER – I

ANATOMY:

Radiological anatomy consisting of relevant embryology of skull, central nervous system, Cardiovascular system, respiratory, diaphragm, gastrointestinal tract, genitourinary tract others;Radiological anatomy of facial planers of neck; pharynx, nasopharynx and larynx; Anatomy of heart and major vessels; Anatomy of ear, orbit, teeth; Anatomy of GIT including esophagus, stomach duodenum,small intestine appendix , large bowel, rectum and its associated vascular supply, Genito – urinary systemincluding kidneys , ureters, bladder, both male and female urethra and associated glands e.g prostate, andreproductive organs; sectional anatomy of entire abdominal and mediastinum; The venous and arterialsystem of both extremities; Osteology; joints of both extremities; Spine; Lymphatic system breast etc.

PHYSIOLOGY:

Physiology of excretion; physiology of ventilation perfusion; pulmonary ; pulmonarycirculation the cardiac cycle ; the physiology of CSF flow ; the physiology of renal hypertension; thephysiology of menstrual cycle; the physiology of adrenal thyroid function; physiology of variousendocrine organs, the regulation and radiological correction.

PATHOLOGY:

Pathology of various system of CNS, musculoskeletal systems, CIT diaphragm, CUT,CVS, RS reproductive systems (with special emphasis on tumours, infectious processes, congenitalanomalies); pathology of radiation injury; pathology inflammation, repair, necrosis, gangrene, pathology of vascular injury and repair ; pathology of ischemia; pathology of hematopoietic disorders, malignanciesrelated to this system e.g. lymphomas, storage disorders e.g Gaucher's disease and others.

PHARMACOLOGY:

Pharmacology of materials injected into patients for diagnostic purposes includingradio – nuclide agents; drugs used in the management of contract reactions, cardiocascular stabilization ofcontrast reactions; drugs for pharmacoangiography; drugs used during routing procedures such as barium,angiography etc ; anticoagulants; drugs used to counter cerebral edema; captoprill etc.

BIOCHEMISTRY:

Elementary Radiatopm biology; biochemistry of endocrine glands.

RADIATION PHYSICS:

Fundamentals of electricity; heating effect of current – units of measurementsof work, energy power; energy power; electromagnetic induction- principles of production of AC & DC ,peak values , RMS values and average value of AC; basics of transformers, efficiency of transformers;rectifiers and rectification – timers; X – ray production and properties, modern X-ray tubes, quantity of X-ray (Rogentgen , RAD, REM) interaction of x-rays with matters; filters if Radiology; physical principlesof x-ray diagnosis ; fluorescence – screens; high KV techniques; foreign body localization; Basicprinciples of image intensification, digital and cine radiography, Ultrasound , Computed Tomography ,Magnetic Resonance Imaging , Positron Emission tomography – Single photon Emission ComputedTomography, Conventional Radiography, Digital radiography, Digital Fluoroscopy & flat panel detector.Picture archiving and communication system (PACS) and radiology information system (RIS) to make afilm less department, telemedicine digital imaging. Radioisotopes – production, structure, basicinstruments in their use, physical properties ; radiation protection – maximum permissible does – filmbadge – methods of protection – safe handling of radio – active isotopes – safe disposal of radioactivematerial.

SYLLABUS FOR PAPER – II

BONES & JOINTS:

Congenital skeletal anomalies, skeletal dysplasia's, chromosomal disorders;periosteal reaction, bone and joint infections, sarcoid; Avascular necrosis of bone, osteochondritis,miscellaneous Ossea, Tuberous; Sclerosis; Diseases of joints, arthrography; Tumors and tumor likeconditions of bone; Disorders of the pumphoreticular system and other hemopoeitic metabolic andendocrine origin including rickets, osteomalacia, scurvy, osteoporosis, quantitative analysis of bone,hemochromatosis Wilson's disease, hyperparathyroidism and others; skeletal trauma-general andregional; radionuclide bone scanning.

CHEST:

Normal chest, methods of investigation and differential diagnosis; Mediastinum;the pleura-collapse and consolidation: Tumours of the lung; Inflammatory diseases of the lung; Chronic bronchitisand emphysema , pneumoconiosis; chest trauma, The post operative chest, intensive care; Radiation; the pediatric chest; Miscellaneous lung conditions e.g. sarcoidosis,fibrosing alveolitis, extrinsic alveolitispulmonary eosinophilic conditions,asthma, eosinophilic granuloma,pulmonary haemorrhage andhemosiderosis, lymphoproliferative disorder,granulomatous such as Wegnerslymphomatoid,bronchocentric,interst itial pneumonias, connective tissue disorders,pulmonary alveolarproteinosis,amyloidosis,bronchial abnormalities such as bronchitis, bronchiectasis etc.,adult respiratorydistress syndrome,pulmonaryossificat ion,oxygen toxicity, pulmonary alveolar microlithiasis;lungs inchronic renal failure,shock etc.

CARDIOVASCULAR SYSTEM:

The normal heart, methods of examination by radiography, ultrasound,angiography, cardiac catheterization, CT scanning, MRI, Radionucleide imaging; the pericardium; thepulmonary circulation; acquired heart disease – e.g, ischemic , valvular, cardiomyopathies etc., congenitalheart disease – general consideration and specific condition – emphasis to be laid on ultrasonographic andangiographic profiles; arteriography and therapeutic angiography; phlebography; the lymphatic system.

CENTRAL NERVOUS SYSTEM:

Anatomy, pathology and methods of examination includingradiography, contrast studies, CT / MRI Doppler studies of carotids and others; the normal skull –radiography of the various views of the skull various anatomical landmarks within the skull, CT anatomyof the skull and its contents, MRI anatomy of the skull and Its contents; the abnormal skull comprising allbony and non – bony lesions of the skull and its contents; intracranial calcification – normal andpathological; neuro – radiology of the spine with emphasis on myelography. CT and MRI; cranialtrauma; infections and inflammation of the brain; diseases of white matter; cranial and intracranialtumours; sellar and parasellar regions; congenital anomalies; cerebrovascular diseases ; craniovertebraljunction imaging – anomalies and acquired lesions; cerebrovascular diseases; craniovertebral junctionimaging – anomalies and acquired lesions; cerebral blood flow determination; neurosonography;hydrocephalus – imaging.

ENT / ORBIT / TEETH / SOFT / TISSUES:

Pharyns and larynx – anatomy, methods of examination ofhealthy and diseased pharyns and laryns; the paranasal sinuses; petrous temporal bone with emphasis onhigh resoulstion CT scanning of this area ; the orbit and eye; the teeth and jaws; the soft tissues; breast,mammography, xero – radiography and thermography etc.

SYLLABUS FOR PAPER – III

GASTROINTESTNAL TRACT AND ABDOMEN:

Methods of examination – radiography and contrast,studies C.T and endoscopic procedures; salivary glands, pharynx and esophagus; stomach andduodenum; the small bowel ; the colon; the acute abdomen; the biliary tract; the liver, spleen andpancreas; the adrenal glands; the pediatric abdomen; interventional

procedures.

UROGENITAL TRACT:

Methods of examination including radiography contrast studies,ultrasonography, CT scanning nuclear medicine and other imaging modalities, congenital lesions of upperand lower urinary / genital tract; cystic diseases of the kidney, tumours of the kidney tumour of the kidneyand ureter ; renal calculi, nephrocalcinosis; urinary infection; renal vascular disease, miscellaneouslesions such as hypertension and renal artery stenosis, small artery disease, radiation nephritis, vascularmalformations of the renal artery, ateriovenous fistulae, fibrosis pyeloureteritis cystic hydroureter ofpregnancy; trauma to the urinary tract – renal injury, ureteric injury, lower urinary tract injuries, methodsof examinations – contrast studies radionuclide studies, Computed tomography etc; the bladder andprostate ; lower urinary tract obstruction, incontinence, postprostectomy problems, obstetric andgynaecological imaging with special emphasis on ultrasound of various disorders of these regions;imaging in renal transpiantation; interventional procedure.

OBSTERTRICS RADIOLOGY:

Obstetrics / fetal sonography – basic ultrasound examination of theuncomplicated pregnancy, ultrasound in all the three trimesters of pregnancy sonography estimation offetal age and weight, sonographic evaluation of maternal disorders during pregnancy, fetal CNSabnormalities, fetal genitourinary tract / thorax / abdomen, sonography of multiple gestation, ultrasoundevaluation of placenta. Assessment of fetalwell being, Duplex Doppler system in obstetrics ultrasound,evaluation of high risk pregnancy, invasive fetal procedures, ectopic pregnancy, IUGR, otherObstetrics radiography; radiation hazards,fetal death.

GYNAECOLOGICAL RADIOLOGY:

Plain radiography, hysterosalpingography and other contraststudy, the urinary tract in gynaecology, congenital abnormality of female genital tract inflammatorydisease of the female fwenital tractm uterine tumours, uterus cysts and tumors of the ovary, intrauterinecontraceptive device, CT/ MRI of female pelvis, normal anatomy of the female pelvis, Ultrasonography:Ultrasonic evaluation of the uterus, gestations, trophoblastic disease, the ovary.

Endocrine& Metabolic disorder:

Imaging in disorders of endocrine system like thyroid, Parathyroid,adrenals and also metabolic disorders like liposomal storage disorder, deficiency disorder.

INTERVENTIONAL RADIOLOGY: (all imaging guided interventional procedures)

Guided FNAC,Biopsy procedure percutaneous transthoracic / abdominal / musculoskeletal biopsies; percutaneouspunctures, decompression and drainage procedure.

SYLLABUS FOR PAPER – IV

MODERN IMAGING/ RECENT ADVANCES:

CT Scan, MRI – technical aspects, CNS and spine, recent advances in imaging of thoracic and abdominallesions – a knowledge of NMR spectroscopy is desirable ; position Emission Tomography, Single photonemission Computed Tomography, Conventional Radiography, Digital Radiography, Digital Fluoroscopy,Flat panel detector system, picture archiving and communication system (PACS), TELE radiology –technical aspects and clinical applications, Radio – isotope imaging, various radio nuclide agents theirtrchnical aspects and clinical applications, Gama Camera – technical aspects

7. Teaching and Learning Methods

PostgraduateTraining

Teaching methodology should be imparted to the students through:

- Lectures, seminars, symposia, Inter- and intra- departmental meetings and journal club. Records of these are to be maintained by the department.
- By encouraging and allowing the students to attend and actively participate in CMEs, Conferences by presenting papers.
- Maintenance of log book: E-portfolio:- It is an electronic portfolio to be maintained by the resident to record their activities under the section:
    - EPA,
    - Daily log
    - Patient care
    - Procedure
    - Dissertation
    - Academic activities(Seminar, symposium, case presentation, journal club)
    - Co-curricular activities (Conference, CME, Workshop),
    - Teaching Assignments,
    - Awards and achievements
    - Outreach activities.
- E-portfolio shall be checked and assessed periodically by the faculty members. This will enable to monitor progress of the resident, his level of attainment of milestone and impart the training accordingly
- Writing thesis following appropriate research methodology, ethical clearance and good clinical practice guidelines.
- The postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- A postgraduate student of a postgraduate degree course in broad specialities/super specialities 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.
- Department should encourage e-learning activities.

Practical and Clinical Training

1. Emphasis should be on self-directed learning, group discussions and case presentations.
2. Student should be trained about proper History taking, Clinical examination, interpretation of various imaging studies

Rotations:

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

1. Conventional chest, abdomen, musculoskeletal skull, spine, PNS, and mammography including Contrast studies: G.U., GIT, Hepato-biliaryangiography etc including fluoroscopic guided interventions-12 months.
2. USG, Doppler and USG guided interventions 8 months.
3. CT and CT guided interventions including Emergency radiology 8months
4. M.R.I 6 months
5. Elective posting 2 months
6. During each posting, post graduate student should be able to perform theprocedures and interpret the findings

PROPOSED SCHEDULE FOR ROTATION

1st year (1/6) (2/6)	Conventional X-ray and contrast	Conventional X-ray and contrast	USG	Conventional X-ray and contrast	Conventional X-ray and contrast	USG
	USG	Conventional X-ray and contrast.	CT	Conventional X-ray and contrast	CT	USG
2nd year (3/6) (4/6)	Conventional X-ray and contrast	CT	Conventional X-ray and contrast	USG	MRI	Conventional X-ray and contrast
	Conventional X-ray and contrast.	MRI	USG	USG	CT	MRI
3rd year (5/6) (6/6)	Conventional X-ray and contrast	MRI	USG	CT	CT	Elective
	Conventional X-ray and contrast	MRI	CT	CT	MRI	Elective

8. Assessment

8.1 Formative Assessment:

Formative assessment is continual and assess medical knowledge, patient care, procedural & academic skills, interpersonal communication skills, system based practice , self-directed learning and professionalism of the activities mentioned every 3/6monthly. EPAs are listed as bellow **(Table 3)** with description of each EPA **(Table 4)**. Progress of the students is recorded after discussion with the student in Entrustable Professional Activity (EPA) assessment form **Annexure-1**.These EPAs are also mapped with PO and CO. **(Table 5)**

Table 3. List the of entrust able Professional Activity

1. Obtain a history & perform a physical examination adapted to the patient is clinical condition.
2. Triages and protocols exams.
3. Interprets & reports X - ray examinations and priorities a DD
4. Performs & reports contrast Procedures.

5. Performs & reports USG examinations (abdomen including pelvis, Obstetrics).
6. Performs & reports Doppler examinations
7. Interprets & reports CT examinations.
8. Interprets & reports MRI examinations.
9. Interprets Mammogram examination.
10. Obtain informed consent and performs image guided diagnostic / Interventions procedures.
11. Communicates Diagnostic imaging findings.
12. Recommends appropriate next steps.
13. Manages patient after imaging procedures.
14. Collaborate as a member of an inter professional team.
15. Behaves Professionally.
16. Formulates clinical questions and retrieves evidence to advance patient care
17. Identifies system failures and contributes to a culture of Safety and Improvement.

Description of Entrustable Professional Activity with relevant domains of competence, domain critical behavior

Table 4. EPAs, Competency levels and entrust ability

EPA 1: Obtain a history & perform a physical examination adapted to the patient`s clinical condition	
1. Description of the activity:	Residents should be able to perform an accurate complete or focused history and physical exam in a prioritized, organized manner without supervision and with respect for the patient. The history and physical examination should be tailored to the clinical situation and specific patient encounter. This data gathering and patient interaction activity serves as the basis for identifying the required diagnostic imaging modality and further management.
2. Most relevant domains of competence:	MK,PC,ICS,P
3. Competencies within each domain critical to entrustment decisions:	MK 3, PC 5, ICS 1, P 1
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	**Pre-Entrust able**	**Entrust able**
MK 3	• Lack of knowledge regarding anatomy, physiology, and pathophysiology of common diseases • Doesnt Understand imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases.	• Has a basic fund of knowledge regarding anatomy, physiology, and pathophysiology of common diseases • Understands imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
PC 5	• Unable to take detailed history and physical examination	• Performs a comprehensive history and physical examination
ICS 1	• Unable to communicate examination results	• Communicates information about imaging and examination results in routine, uncomplicated circumstances
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• Is an effective health care team leader, promoting privacy of patient welfare, patient autonomy, and social justice.

EPA 2: Triages and protocols exams	
1. Description of the activity:	• Identify cases which needs emergency diagnosis and prioritize these patients over normal routineultrasound during routine working hours • Identify the underlying condition and advice the appropriate investigation • Follow the appropriate imaging protocol for every case
2. Most relevant domains of competence:	MK,PC
3. Competencies within each domain critical to entrustment decisions:	MK 4,5,7 PC 1,3
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MK 4	• Unable to Select appropriate protocols and contrast agent/dose for advanced imaging. • Doesn't demonstrate knowledge of physical principles to optimize image quality.	• Selects appropriate protocols and contrast agent/dose for advanced imaging. • Demonstrates knowledge of physical principles to optimize image quality.
MK 5	• Doesn't Demonstrate knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction	• Demonstrates knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction
MK 7	• Unable to uniformly practice ALARA principles for patients, family, staff, andpublic • Lack of knowledge in more complex concepts of procedural safety and its contraindications	• Uniformly practices ALARA principles for patients, family, staff, andpublic • Knows more complex concepts of procedural safety and contraindications
PC 1	• Unable to Recommend appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently

PC 3	• Unable to demonstrate recognition and management of contrast reactions. • **Radiation Safety** Unable to communicate therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Unable to communicate MR safety of common implants and retained foreign bodiesto patients andpractitioners.	• **Contrast Agents:** Demonstrates recognition and management of contrast reactions. • **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners.

EPA 3: Interprets & reports X - ray examinations and priorities a DD	
1. Description of the activity:	• Proper identification of the patient, proper positioning/ targeted views, exposure factors, assigningcorrect laterality to the film. • Identify the normal variants ,significant findings and pathologies and give a precise diagnosis/differential diagnosis in appropriate scenario • Obtain additional views and to advice the next line of investigation if necessary.
2. Most relevant domains of competence:	MK,PC,ICS
3. Competencies within each domain critical to entrustment decisions:	MK 2,5,6 PC 1,6 ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	**Pre-Entrust able**	**Entrust able**
MK 2	• Unable to Proficiently integrate knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 5	• Unable to Demonstrate knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction	• Demonstrates knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction
MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommend management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management.
PC 1	• Unable to Recommend appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently

PC 6	• unable to Efficiently generate clear and concise reports that rarely requirecor-rection • Unable to Use lexicons and structured reporting that rarely requirecorrection.	• Efficiently generates clear and concise reports that rarely requirecorrection • Uses lexicons and structured reporting that rarely requirecorrection.
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complica-tions, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations.

EPA 2: Triages and protocols exams	
1. Description of the activity:	• Proper identification of the patient, proper positioning/ targeted views, exposure factors, assigningcorrect laterality to the film. • Appropriate usage of contrast material for a particular study. • Identify the normal variants and significant findings and pathologies and give a precise diagnosis/differential diagnosis in appropriate scenario • Obtain additional views and to advice the next line of investigation if necessary.
2. Most relevant domains of competence:	• MK,PC
3. Competencies within each domain critical to entrustment decisions:	• MK 1,2,3,4,5,6,7 • PC 1,2,3,4,6, • ICS1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MK 1	• Unable to Apply knowledge of basic medical physics and radiobiology to imaging. • Unable to Demonstrate knowledge of instrument quality control and image reconstruction. • Unable to Demonstrate knowledge of the indications, contraindications, side-effects, and complications of pharmacologic agents.	• Applies knowledge of basic medical physics and radiobiology to imaging. • Demonstrates knowledge of instrument quality control and image reconstruction. • Demonstrates knowledge of the indications, contraindications, side- effects, and complications of pharmacologic agents.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
MK 4	• Unable to Selects appropriate protocols and contrast agent/dose for advanced imaging • Unable to Demonstrate knowledge of physical principles to optimize image quality.	• Selects appropriate protocols and contrast agent/dose for advanced imaging • Demonstrates knowledge of physical principles to optimize image quality.
MK 5	• Unable to Demonstrate knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction	• Demonstrates knowledge of instrument quality control and image reconstruction, troubleshoots for artifact reduction
MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management.
MK 7	• Unable to Uniformly practices ALARA principles for patients, family, staff, andpublic • Doesnt know more complex concepts of procedural safety and contraindications	• Uniformly practices ALARA principles for patients, family, staff, andpublic • Knows more complex concepts of procedural safety and contraindications
PC 1	• Unable to Recommends appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 2	• Unable to Competently performs advanced procedures ,and cannot recognizes and manages complications of advanced procedures	• Competently performs advanced procedures ,recognizes and manages complications of advanced procedures

PC 3	• **Contrast Agents:** Unable to demonstrate recognition and management of contrast reactions. • **Radiation Safety:** Unable toCommunicate therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Unable to communicateMR safety of common implants and retained foreign bodiesto patients andpractitioners.	• **Contrast Agents:** Re-demonstrates recognition and management of contrast reactions. • **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners.
PC 4	• Unable to Use magnification appropriately and judiciously • Unable to Modify the fluoroscopy rate during procedures	• Uses magnification appropriately and judiciously • Modifies the fluoroscopy rate during procedures
PC 6	• Unable to Efficiently generates clear and concise reports that rarely require correction • Unable to Uses lexicons and structured reporting that rarely require correction	• Efficiently generates clear and concise reports that rarely require correction • Uses lexicons and structured reporting that rarely require correction
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations.

EPA 5: Performs USG examinations (abdomen including pelvis, Obstetrics)	
1. Description of the activity:	• Proper identification of the patient. Acquire adequate clinical and biochemical data. • Appropriate usage of probe [low or high frequency] with optimal ultrasound settings for each patients. • Ability to perform and interpret gray scale ultrasound and elastography. • Knowledge about various maneuvers during gray scale examination for obtaining complete details • during targeted ultrasound.
2. Most relevant domains of competence:	MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	MK 12,3,6 PC 1,2,6 P 1 ICS 1,2

4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MKI	• Unable to Apply knowledge of basic medical physics and radiobiology to ultrasound imaging.	• Applies knowledge of basic medical physics and radiobiology to imaging.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management
PC 1	• Unable to Recommends appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 2	• Unable to Competently performs advanced procedures, and cannot recognizes and manages complications of advanced procedures	• Competently performs advanced procedures ,recognizes and manages complications of advanced procedures
PC 6	• Unable to Efficiently generates clear and concise reports that rarely require correction • Unable to Uses lexicons and structured reporting that rarely require correction	• Efficiently generates clear and concise reports that rarely require correction • Uses lexicons and structured reporting that rarely require correction
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news

ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable to Communicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 6: Performs & reports Doppler examinations	
1. Description of the activity:	• Proper identification of the patient. Acquire adequate clinical and biochemical data. • Appropriate usage of probe [low or high frequency] with optimal ultrasound settings for each patients. • Ability to perform and interpret colour doppler ultrasound. • Knowledge about various maneuvers during colour doppler examination for obtaining complete detailsduring targeted ultrasound.
2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• MK 1,2,3,6 • PC 1,2,6 • P 1 • ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	**Pre-Entrust able**	**Entrust able**
MKI	• Unable to Apply knowledge of basic medical physics and radiobiology to ultrasound imaging.	• Applies knowledge of basic medical physics and radiobiology to imaging.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases

MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management
PC 1	• Unable to Recommends appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 2	• Unable to Competently performs advanced procedures ,and cannot recognizes and manages complications of advanced procedures	• Competently performs advanced procedures ,recognizes and manages complications of advanced procedures
PC 6	• Unable to Efficiently generates clear and concise reports that rarely require correction • Unable to Uses lexicons and structured reporting that rarely require correction	• Efficiently generates clear and concise reports that rarely require correction • Uses lexicons and structured reporting that rarely require correction
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 7: Interprets CT examinations	
1. Description of the activity:	• Proper identification of the patient. Acquire adequate clinical and biochemical data. • Advice appropriate protocol for particular clinical indication. • Identify the normal variants and significant findings, and pathologies and give a precise diagnosis/differential diagnosis in appropriate scenario • Obtain additional sequences and reformating of images and to advice the next line of investigation if necessary.
2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• MK1, 2,3,6 • PC 1,6 • P 1 • ICS 1,2

4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MKI	• Unable to Apply knowledge of basic medical physics and radiobiology to imaging.	• Applies knowledge of basic medical physics and radiobiology to imaging.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
MK 6	• Unable to provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management
PC 1	• Unable to Recommends appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 6	• Unable to Efficiently generates clear and concise reports that rarely require correction • Unable to Uses lexicons and structured reporting that rarely require correction	• Efficiently generates clear and concise reports that rarely require correction • Uses lexicons and structured reporting that rarely require correction
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 8: Interprets MRI examinations.	
1. Description of the activity:	• Proper identification of the patient. Acquire adequate clinical and biochemical data. • Advice appropriate protocol for particular clinical indication. • Identify the normal variants and significant findings, and pathologies and give a precise diagnosis/differential diagnosis in appropriate scenario • Obtain additional sequences and to advice the next line of investigation if necessary
2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• MK 2,3,6 • PC 1,6 • P 1 • ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MKI	• Unable to Apply knowledge of basic medical physics and radiobiology to imaging.	• Applies knowledge of basic medical physics and radiobiology to imaging.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management
PC 1	• Unable to Recommends appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 6	• Unable to Efficiently generates clear and concise reports that rarely require correction • Unable to Uses lexicons and structured reporting that rarely require correction	• Efficiently generates clear and concise reports that rarely require correction • Uses lexicons and structured reporting that rarely require correction

P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable to Communicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 9: Interprets mammogram examinations.	
1. Description of the activity:	• Proper identification of the patient. Acquire adequate clinical and biochemical data.. • Identify the normal variants and significant findings, and pathologies and give a precise diagnosis/differential diagnosis in appropriate scenario • Obtain additional images and to advice the next line of investigation if necessary
2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• MK 2,3,6 • PC 1,6 • P 1 • ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	**Pre-Entrust able**	**Entrust able**
MKI	• Unable to Apply knowledge of basic medical physics and radiobiology to imaging.	• Applies knowledge of basic medical physics and radiobiology to imaging.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis

MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management
PC 1	• Unable to Recommends appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 6	• Unable to Efficiently generates clear and concise reports that rarely require correction • Unable to Uses lexicons and structured reporting that rarely require correction	• Efficiently generates clear and concise reports that rarely require correction • Uses lexicons and structured reporting that rarely require correction
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 10: Obtain informed consent and performs image guided diagnostic / Interventional procedures	
1. Description of the activity:	• Residents should be able to perform patient care interventions that require informed consent for interventions, tests, or procedures they order or perform (e.g., immunizations, central lines, contrast and radiation exposures, blood transfusions) but should not be expected to obtain informed consent for procedures or tests for which they do not know the indications, contraindications, alternatives, risks, and benefits.

2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• MK 1,2,3,7 • PC 1,2,3,4,6 • P 1 • ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MKI	• Unable to Apply knowledge of basic medical physics and radiobiology to imaging.	• Applies knowledge of basic medical physics and radiobiology to imaging.
MK 2	• Unable to Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis	• Proficiently integrates knowledge of anatomic and molecular imaging with patho physiology to formulate a diagnosis
MK 3	• Unable to Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases	• Appropriately synthesizes imaging findings based on knowledge of anatomy, physiology, and pathophysiology of diseases
MK 7	• Unable to Uniformly practices ALARA principles for patients, family, staff, andpublic • Doesn't know more complex concepts of procedural safety and contraindications	• Uniformly practices ALARA principles for patients, family, staff, andpublic • Knows more complex concepts of procedural safety and contraindications

EPA 11: Communicates Diagnostic imaging findings.	
1. Description of the activity:	• To mention all the relevant findings in the order of relevance with appropriate diagnosis and possibledifferential diagnosis in arelevant and understandable way to the patients and relatives • To alert the referring clinician regarding the critical findings. • To suggest further investigations/ evaluation for confirmation for the imaging findings and diagnosis if necessary.
2. Most relevant domains of competence:	• MK,PC,SBP,ICS
3. Competencies within each domain critical to entrustment decisions:	• P1 • ICS 1,2

4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable to Communicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 12: Recommends appropriate next steps.	
1. Description of the activity:	• To advice or suggest the referring clinician/ patient about the next line of management for confirmation for the imaging findings and diagnosis if necessary.
2. Most relevant domains of competence:	• MK,PC,ICS
3. Competencies within each domain critical to entrustment decisions:	• MK 6 • ICS 1,2 • P1
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MK 6	• Unable to Provide accurate, focused, and efficient interpretations. • Unable to Prioritize differential diagnoses and recommends management.	• Provides accurate, focused, and efficient interpretations. • Prioritizes differential diagnoses and recommends management
P 1	• Unable to play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice	• play a effective role as health care team member in promoting privacy of patient welfare ,patient autonomy and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 13: Manages patient after imaging procedures	
1. Description of the activity:	• Confident in managing contrast related reactions. • Manage complications during image guided interventions and maintaining appropriate line of careduring shifting patient from radiology department to the ward for observation/ management.
2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• PC 3 • P 1 • ICS 1
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
PC 3	• **Contrast Agents:** Unable to demonstrate recognition and management of contrast reactions. • **Radiation Safety:** Unable toCommunicate therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Unable toCommunicate MR safety of common implants and retained foreign bodiesto patients andpractitioners	• **Contrast Agents:** Re-demonstrates recognition and management of contrast reactions. • **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners
P 1	• Unable to perform the role of effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice	• Is an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news

EPA 14: Collaborate as a member of an inter professional team	
1. Description of the activity:	• Effective teamwork is necessary to achieve the Institute of Medicine competencies for care that is safe, timely, effective, efficient, and equitable. Introduction to the roles, responsibilities, and contributions of individual team members early in professional development is critical to fully embracing the value that teamwork adds to patient care outcomes.
2. Most relevant domains of competence:	• MK,PC,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• PC 1 • P 1,2 • ICS 2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
PC 1	• Unable to Recommend appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently

P 1	• Unable to perform the role of effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice	• Is an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice
P 2	• Unable to perform the role effective health care team leader, promoting departmental and institutional goals	• Is an effective health care team leader, promoting departmental and institutional goals
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

EPA 15: Behaves professionally	
1. Description of the activity:	• To attend the patient promptly and respond with love and care. • To present themselves in a professional manner • To avoid unethical practices and adhere to strict aseptic precaution during all procedures.
2. Most relevant domains of competence:	• P
3. Competencies within each domain critical to entrustment decisions:	• P 1,3
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	**Pre-Entrust able**	**Entrust able**
P 1	• Unable to perform as an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice	• Is an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice
P 3	• Doesnt act as role model for conference attendance promptness, and attention to assigned tasks Prepares materials and presents at assigned morbidity and mortality and other conferences	• Acts as a role model for conference attendance promptness, and attention to assigned tasks Prepares materials and presents at assigned morbidity and mortality and other conferences

EPA 16: Formulates clinical questions and retrieves evidence to advance patient care	
1. Description of the activity:	• Updating recent advances in imaging and interventional procedures to provide better patient care bycomparing with previous data and practice evidence based medicine
2. Most relevant domains of competence:	• MK,PC,SBP,PBL1,P,ICS
3. Competencies within each domain critical to entrustment decisions:	• PC 1,3 • PBL1 1,2,3 • SBP 1,2,3,4 • P 1,2 • ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
PC 1	• Unable to Recommend appropriate imaging of uncommon conditions independently	• Recommend appropriate imaging of uncommon conditions independently
PC 3	• **Contrast Agents:** Doesn't -unable to demonstrate recognition and management of contrast reactions. • **Radiation Safety:** Unable to communicate therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Unable to Communicate MR safety of common implants and retained foreign bodiesto patients andpractitioners	• **Contrast Agents:** Re-demonstrates recognition and management of contrast reactions. • **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners
PBL1 1	• Unable to Evaluates and modifies learning plan	• Evaluates and modifies learning plan
PBL1 2	• Unable to Begin scholarly project	• Begins scholarly project

PBL1 3	• Unable to seeks performance data and feedback, with humility and adaptability • Unable to Analyzes, reflects on, and institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance • Unable to Designs and implements a learning plan independently	• seeks performance data and feedback, with humility and adaptability • Analyzes, reflects on, and institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance • Designs and implements a learning plan independently
SBP 1	• Unable to Identify and begins a systems-based practice project incorporating QI methodology	• Identifies and begins a systems-based practice project incorporating QI methodology
SBP 2	• Unable to Describe the technical and professional components of imaging costs	• Describes the technical and professional components of imaging costs
SBP 3	• Unable to Contributes meaningfully to the multidisciplinary • Conference	• Contributes meaningfully to the multidisciplinary • Conference
SBP 4	• Unable to Use local resources effectively to meet the demands of the patient and community	• Uses local resources effectively to meet the demands of the patient and community
P1	• Unable to perform as an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice	• Is an effective health care team leader, promoting primacy of patient welfare, patient autonomy, and social justice
P2	• Is an effective health care team leader, promoting departmental and institutional goals	• Is an effective health care team leader, promoting departmental and institutional goals
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable toCommunicate appropriately under stressful situations.	• Acts as a role model for conference attendance promptness, and attention to assigned tasks Prepares materials and presents at assigned morbidity and mortality and other conferences

EPA 17: Identifies system failures and contributes to a culture of Safety and Improvement	
1. Description of the activity:	• Residents should be able the find the lacuna of error in radiology departmentand its coordination with other departments in technical aspects,patient care and should be able to arrive at ways to minimise error
2. Most relevant domains of competence:	• MK,PC,SBP,P,ICS

3. Competencies within each domain critical to entrustment decisions:	• MK 4,7 • C 1,3 • SBP 1 • P 1,2,3 • ICS 1,2
4. Methods of assessment	• Periodic written exam (Every 6 months) • Mini-cex • Workplace assessment by Faculty • Multisource feedback a. Patient b. Nurses c. Health care workers d. Peers

Competency	Pre-Entrust able	Entrust able
MK 4	• Unable to Select appropriate protocols and contrast agent/dose for advanced imaging as defined by the residency program. • Unable to Demonstrate knowledge of physical principles to optimize image quality.	• Selects appropriate protocols and contrast agent/dose for advanced imaging as defined by the residency program. • Demonstrates knowledge of physical principles to optimize image quality.
MK 7	• Unable to Uniformly practice ALARA principles for patients, family, staff, andpublic • Lack of knowledge of more complex concepts of procedural safety and contraindications.	• Uniformly practices ALARA principles for patients, family, staff, andpublic • Knows more complex concepts of procedural safety and contraindications.
PC 1	• Unable to Recommend appropriate imaging of uncommon conditions independently	• Recommends appropriate imaging of uncommon conditions independently
PC 3	• **Contrast Agents:** Doesn't -unable to demonstrate recognition and management of contrast reactions. • **Radiation Safety:** Unable to communicate therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** unable to Communicate MR safety of common implants and retained foreign bodiesto patients andpractitioners.	• **Contrast Agents:** Re-demonstrates recognition and management of contrast reactions. • **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners
SEP 1	• Unable to Identify and begins a systems-based practice project incorporating QI methodology.	• Identifies and begins a systems-based practice project incorporating QI methodology.
P1	• unable to perform as an effective health care team leader, promoting privacy of patient welfare, patient autonomy, and social justice.	• Is an effective health care team leader, promoting privacy of patient welfare, patient autonomy, and social justice.

P2	• Is an effective health care team leader, promoting departmental and institutional goals	• Is an effective health care team leader, promoting departmental and institutional goals
P3	• Doesnt act as role model for conference attendance promptness, and attention to assigned tasks Prepares materials and presents at assigned morbidity and mortality and other conferences	• **Contrast Agents:** Re-demonstrates recognition and management of contrast reactions. • **Radiation Safety:** Communicates therelative risk of exam-specific radiation exposure to patients andpractitioners. • **MR Safety:** Communicates MR safety of common implants and retained foreign bodiesto patients andpractitioners
ICS 1	• Unable to Communicate complex and difficult information, such as errors, complications, adverse events, and bad news	• Communicates complex and difficult information, such as errors, complications, adverse events, and bad news
ICS 2	• Unable to efficiently generate clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Unable to Communicate appropriately under stressful situations.	• **Written/electronic :** Efficiently generates clear and concise reports that do not require substantive faculty member correction on common complex cases • **Verbal:** Communicates appropriately under stressful situations

S.NO	EPA	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8	CO9	CO10	CO11	CO12	CO13	CO14	CO15	CO16	CO17	CO18	CO19
1	Obtain a history & perform a physical examination adapted to the patient is clinical condition.						✓	✓	✓		✓	✓	✓	✓						✓
2	Triages and protocols exams.				✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓			✓
3	Interprets & reports X - ray examinations and priorities a DD.	✓	✓	✓		✓	✓		✓	✓	✓			✓						✓
4	Performs & reports contrast Procedures.	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓						✓
5	Performs USG examinations (abdomen including pelvis, Obstetrics).	✓	✓	✓		✓	✓		✓	✓	✓			✓			✓			✓
6	Performs & reports Doppler examinations.	✓	✓	✓		✓	✓		✓	✓	✓			✓			✓			✓
7	Interprets CT examinations.	✓	✓	✓		✓	✓		✓	✓	✓			✓						✓
8	Interprets MRI examinations.	✓	✓	✓		✓	✓		✓	✓	✓			✓	✓	✓				✓
9	Interprets Mammogram examination.	✓	✓	✓		✓	✓		✓											✓
10	Obtain informed consent and performs image glinded diagnostic / Interventions procedures.	✓	✓	✓	✓	✓	✓		✓											✓
11	Communicates Diagnostic imaging findings.						✓		✓		✓			✓						✓

12	Recommends appropriate next steps.						✓	✓		✓		✓	✓							✓
13	Manages patient after imaging procedures.							✓		✓			✓							✓
14	Collaborate as a member of an inter professional team.						✓					✓								✓
15	Behaves Professionally.					✓	✓	✓		✓		✓	✓							✓
16	Formulates clinical questions and retrieves evidence to advance patient care						✓					✓			✓	✓				
17	Identifies system failures and contributes to a culture of Safety and Improvement.																			

S.NO	EPA	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8	CO9	CO10	CO11	CO12
1	Obtain a history & perform a physical examination adapted to the patient is clinical condition.		✓						✓				
2	Triages and protocols exams.	✓	✓		✓	✓							
3	Interprets & reports X - ray examinations and priorities a DD.		✓						✓		✓		
4	Performs & reports contrast Procedures.	✓	✓	✓	✓	✓				✓			
5	Performs & reports USG examinations (abdomen including pelvis, Obstetrics).		✓		✓	✓			✓				
6	Performs & reports Doppler examinations.		✓		✓	✓			✓	✓			
7	Interprets & reports CT examinations.		✓		✓				✓				
8	Interprets & reports MRI examinations.		✓		✓				✓				
9	Interprets Mammogram examination.		✓		✓				✓				
10	Obtain informed consent and performs image glinded diagnostic / Interventions procedures.	✓	✓	✓	✓	✓			✓	✓			✓

11	Communicates Diagnostic imaging findings.								✓	✓			✓
12	Recommends appropriate next steps.				✓	✓			✓				✓
13	Manages patient after imaging procedures.		✓		✓	✓			✓				✓
14	Collaborate as a member of an inter professional team.						✓						✓
15	Behaves Professionally.												✓
16	Formulates clinical questions and retrieves evidence to advance patient care				✓			✓			✓	✓	
17	Identifies system failures and contributes to a culture of Safety and Improvement.				✓			✓					✓

- The Internal Assessment should be conducted in theory and clinical examination every 6 months
- Quarterly assessment during the MD training should be based on following educational activities:

    1. Journal based / recent advances learning
    2. Patient based /Laboratory or Skill based learning
    3. Self directed learning and teaching
    4. Departmental and interdepartmental learning activity
    5. External and Outreach Activities / CMEs

The student to be assessed periodically as per categories listed in postgraduate student appraisal form **(Annexure-2)**

8.2 Summative Assessment:

Eligibility for appearing in the final university exam

- Attendance : 75 % in each year
- One poster presentation in International/National/ State level conference.
- One oral presentation International/National/ State level conference.
- Submission of one scientific paper for publication to an indexed journal

Postgraduate Examination shall be in three parts:

1. Thesis

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. 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 and will be evaluated by two external. 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.

2. Theory Examination:

There should be four theory papers, as given below:

- Paper I : Radiological physics with basic medical science
- Paper II : Chest, CVS,CNS including Head & Neck ,Eye, ENT, Musculoskeletal, pediatric radiology and mammography-
- Paper III : Abdominal Imaging including GI, GU, Hepatobiliary, endocrine and metabolic, Obstetrics and Gynecology and interventional radiology.
- Paper IV : Recent Advances, Nuclear medicine and radiology related to clinical

specialities including oncologic imaging

Each theory paper will be of 100 marks i.e. 4 papers – 100 marks each (Total 400). Each paper will have 10 short essay answer questions of 10 marks each.

3. Clinical ,Oral/viva voce Examination including Dissertation and Spotters: shall be as given below:

Each students will be evaluated with all the components of clinical and viva-voce

- Clinical (200)
    - Long Case: 1 case (75 marks)
    - Short Case: 2 case (100)
    - Spotters marks

o Viva-voce : (100)

Radiation physics and quality assurance

Implements,catheters and contrast

Cassettes,films,dark room and equipment

Radiographic techniques ,radiological procedures

Gross pathology

Pass criteria:The examination MD shall be held at the end of 3rd academic year. There will be four evaluation for each theory paper. The examinations shall be organised on the basis of 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. Student must secure minimum of 40% in each paper and in aggregate 50% overall as far as theory is concerned .

9. Blue Print of Weight of System

PG Degree Examinations

MD Radio Diagnosis

PAPER –I

BASIC SCIENCES INCLUDING PHYSIOLOGY,PHARMACOLOGY,PATHOLOGY,BIOCHEMISTRY,INCLUDING RADIOLOGICAL ANATOMY AND PHYSICS

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all the questions

Write short Essay on:

RADIOLOGICAL ANATOMY:

TOTAL NUMBER OFQUESTIONS: 3

RADIOLOGICAL PHYSICS:

TOTAL NUMBER OFQUESTIONS: 3

PHYSIOLOGY:

TOTAL NUMBER OFQUESTIONS: 1

PHARMACOLOGY:

TOTAL NUMBER OFQUESTIONS: 1

PATHOLOGY:

TOTAL NUMBER OFQUESTIONS: 1

BIOCHEMISTRY:

TOTAL NUMBER OFQUESTIONS: 1

Sl.No	Topics	Weightage	No of questions	Marks
1	Radiological anatomy	30%	3	30
2	Radiological physics	30%	3	30
3	Physiology	10%	1	10
4	Pharmacology	10%	1	10
5	Biochemistry	10%	1	10
6	Pathology	10%	1	10

PAPER –II

IMAGING OF CHEST, CVS, CNS INCLUDING HEAD & NECK ,EYE, ENT, MUSCULOSKELETAL, PEDIATRIC RADIOLOGY AND MAMMOGRAPHY-

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all the questions

Write short Essays on:

IMAGING OF CHEST:

TOTAL NUMBER OFQUESTIONS: 2

CARDIO VASCULAR SYSTEM IMAGING:

TOTAL NUMBER OFQUESTIONS: 1

MUSCULOSKELATAL SYSTEM IMAGING:

TOTAL NUMBER OFQUESTIONS: 3

IMAGING OF CENTRAL NERVOUS SYSTEM:

TOTAL NUMBER OFQUESTIONS: 2

IMAGING OF pediatric radiology/Mammography :

TOTAL NUMBER OFQUESTIONS: 1

IMAGING OF Head and NECK :

TOTAL NUMBER OFQUESTIONS: 1

Sl.No	Topics	Weightage	No of questions	Marks
1	Imaging of chest	20%	2	20
2	CVS imaging	10%	1	10
3	Imaging of CNS	20%	2	20
4	Pediatric radiology/ mammography	10%	1	10
5	MSK Imaging	30%	3	30
6	Head &Neck Imaging	10%	1	10

PAPER –III

IMAGING OF ABDOMINAL IMAGING INCLUDING GI, GU, HEPATOBILIARY, ENDOCRINE AND METABOLIC, OBSTETRICS AND GYNECOLOGY AND INTERVENTIONAL RADIOLOGY

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all the questions

Write short Essays on:

IMAGING OF GASTRO INTESTINAL TRACT AND ABDOMEN including hepatobiliary :

TOTAL NUMBER OFQUESTIONS: 3

IMAGING OF UROGENITAL TRACT:

TOTAL NUMBER OFQUESTIONS: 2

IMAGING IN OBSTETRICS AND GYNAECOLOGY:

TOTAL NUMBER OFQUESTIONS: 2

IMAGING IN INTERVENTIONAL RADIOLOGY,AND MISCELLANEOUS like Endocrine and metabolic disease:

TOTAL NUMBER OFQUESTIONS: 3

Sl.No	Topics	Weightage	No of questions	Marks
1	Imaging of GI system,abdomen including hepatobiliary system	30%	3	30
2	Imaging of Urogenital system	20%	2	20
3	Imaging of Obstetrics and gynaecology	20%	2	20
4	Imaging in interventional radiology &Miscellaneous	30%	3	30

PAPER –IV

IMAGING OF ONCOLOGY, NUCLEAR RADIOLOGY, RECENT ADVANCES AND MISCELLANEOUS.

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all the questions

Write short Essays on:

IMAGING IN ONCOLOGY:

TOTAL NUMBER OFQUESTIONS: 2

IMAGING IN NUCLEAR MEDICINE:

TOTAL NUMBER OFQUESTIONS: 2

IMAGING IN RECENT ADVANCES:

TOTAL NUMBER OFQUESTIONS: 6

Sl.No	Topics	Weightage	No of questions	Marks
1	Imaging in oncology	20%	2	20
2	Imaging in Nuclear medicine	20%	2	20
3	Imaging of Recent advances and miscellaneous	60%	6	60

10. Model Question Paper

PG DEGREE EXAMINATION-

BRANCH-VII-M.D.RADIO DIAGNOSIS

PAPER –I- BASIC SCIENCES

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

INSTRUCTIONS:

1. ANSWER ALL QUESTIONS
2. ALL QUESTIONS CARY EQUAL MARKS

Write short essays on: (10X10 = 100 Marks)

1. Anatomy of cerebral venous Sinuses
2. CT and MRI anatomy of Basal Ganglia and internal capsule and its significance
3. Radiological Anatomy of shoulder joint.
4. Physiology of CSF flow
5. Pathology of Ovarian Tumors.
6. Different types of MRI Contrast media
7. Radiological anatomy of the mediastinum.
8. MR Spectroscopy
9. Flat panel detectors.
10. CT Artifacts

PG DEGREE EXAMINATION-
M.D.RADIO DIAGNOSIS

PAPER –II

IMAGING OF CHEST, CVS,CNS INCLUDING HEAD & NECK ,EYE, ENT, MUSCULOSKELETAL, PEDIATRIC RADIOLOGY AND MAMMOGRAPHY

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all questions in the same order

1. Imaging findings in pleural effusion and the role of imaging in treatment and assessment the same.
2. Classification, incidence, etiology and imaging findings in thoracic aortic dissection.
3. Outlines the divisions of mediastinum and imaging abnormalities in middle mediastinal disorders.
4. Path physiology of superior labrum lesions and MRI appearances of the same
5. Describe the MRI appearances in injury to the knee.
6. CT and MRI appearances in benign skeletal tumours.
7. Etio-pathology and imaging findings in aneurismal sub arachnoid hemorrhage.
8. Causes of cerebral venous thrombosis and its imaging appearances
9. Differential diagnosis of optic nerve sheath lesions and how will you approach them
10. MR mammography

PG DEGREE EXAMINATION
M.D.RADIO DIAGNOSIS

PAPER –III

IMAGINGABDOMINAL IMAGING INCLUDING GI, GU, HEPATOBILIARY, ENDOCRINE AND METABOLIC, OBSTETRICS AND GYNECOLOGY AND INTERVENTIONAL RADIOLOGY

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all questions in the same order

1. Describe the normal anatomy of esophagus and the imaging findings in beningnesophagealtumors.
2. Describe the imaging technique of CT and MR enterography.
3. Imaging finding in small bowel lymphoma.
4. Classify the cystic diseases of kidney and describe the imaging appearances.
5. CT and MRI evaluation in testicular malignancy.
6. Role of Doppler in intra uterine growth retardation.
7. First trimester Screening
8. Percutaneous CT guided aspiration and drainage.
9. Imaging in parathyroid disorders
10. Crystal deposition arthritis - diagnosis by radiology.

PG DEGREE EXAMINATION
M.D.RADIO DIAGNOSIS

PAPER –IV

IMAGING OF RECENT ADVANCES, NUCLEAR MEDICINE AND RADIOLOGY RELATED TO CLINICAL SPECIALITIES INCLUDING ONCOLOGIC IMAGING, AND EMERGENCY MEDICINE

DATE : Maximum Marks:100

Time : 3 Hours (10x10=100)

Answer all questions in the same order

1. 3D USG
2. Use of positron emission tomography scanning in radiology.
3. MR Elastography
4. Functional MRI of brain
5. SPECT
6. Fetal MRI
7. Classification and Imaging findings in Nasal and Paranasal Sinus Tumors.
8. Write about vascular ultrasound
9. Cardiac CT.
10. Imaging of osteoid osteoma and interventional management.

11. Recommended Reading

LIST OF JOURNALS

1. The Indian Journal of Radiology and Imaging
2. Radiology clinics of north America
3. Radiology
4. Radiographics
5. MRI clinics of north America
6. Journal of US medicine
7. Journal of vascular interventional radiology.

BOOKS

1. Grainger & Allison's Text book of Diganostic Radiology (ChurchillLivingstone).
2. Test book of gastrointestinal Radiology – Gore and Levine (Saunders).
3. MRI of Brain and Spine – Scott Atlas (LWW).
4. Diagnosis of Disease of the Chest Fraser.
5. Diagnostic Imaging Series: (Amirsys, Elsevier) abdominal imaging, Orthopedics, Head and Neck, Neuroradiology, Pediatric radiology Chest,Obstetrics, Breast.
6. MRI in Orthopedics and Sport Injuries – Stoller.
7. Skeletal Radiology – Greenspan.
8. Abdominal – Pelvic MRI – Semelka (IWW).
9. Caffey's Pediatric Radiology.
10. CTI and MRI of the whole body-John R. Haaga.
11. Text book of Radiology and imaging – Davodsulton.
12. Diagnostic ultrasound – Carol C. Rumack.
13. AIIMS – MAMC-PG's Comprehensive Text book of DiagnosisRadiology, Volumes1,2,3.

12. Annexure

Annexure-1: Entrust able Professional Activities Assessment

Mahatma Gandhi Medical College and Research Institute

Department Of Radiodiagnosis

Entrustable Professional Activities Assessment Form MDRD Residents.

Name of the Resident: UNI No:

Levels of competence:

Level I :	Knowledge only; can observe
Level II(A) :	Can assist properly
Level II(B) :	Can do under strict supervision
Level III :	Can do under loose supervision
	(Entrustability decision to be made based onmilestones)
Level IV :	Can do independently
Level V :	Has expertise to teach others

	EPAs	On the day joining	After 1 month	1st Quarter		2nd Quarter	
		Resident	Resident	Faculty	Resident	Faculty	Resident
	GENERAL						
1	Obtain a history & perform a physical examination adapted to the patient is clinical condition						
2	Triages and protocols exams.						
3	Interprets & reports X - ray examinations and priorities a DD.						
4	Performs & reports contrast Procedures.						
5	Performs USG examinations (abdomen including pelvis, Obstetrics).						
6	Performs & reports Doppler examinations.						
7	Interprets CT examinations.						
8	Interprets MRI examinations.						
9	Interprets Mammogram examination.						
10	Obtain informed consent and performs image glinded diagnostic / Interventions procedures.						
11	Recommends appropriate next steps.						
		3rd Quarter				4th quarter	
		Resident		Faculty		Resident	Faculty
12	Recommends appropriate next steps.						
13	Manages patient after imaging procedures.						
14	Collaborate as a member of an inter professional team.						
15	Behaves Professionally						
16	Formulates clinical questions and retrieves evidence to advance patient care						
17	Identifies system failures and contributes to a culture of Safety and Improvement.						
	Signature of the resident						
	Signature faculty						
	Signature of the HOD						

SECOND YEAR OF THE RESIDENCY

		5thquarter		6thquarter	
s.no	**Radio diagnosis**	**Resident**	**Faculty**	**Resident**	**Faculty**
1	Obtain a history & perform a physical examination adapted to the patient is clinical condition				
2	Triages and protocols exams.				
3	Interprets & reports X - ray examinations and priorities a DD.				
4	Performs & reports contrast Procedures.				
5	Performs USG examinations (abdomen including pelvis, Obstetrics).				
6	Performs & reports Doppler examinations.				
7	Interprets CT examinations.				
8	Interprets MRI examinations.				
9	Interprets Mammogram examination.				
10	Obtain informed consent and performs image glinded diagnostic / Interventions procedures.				
11	Recommends appropriate next steps.				
12	Recommends appropriate next steps				
13	Manages patient after imaging procedures.				
14	Behaves Professionally.				
15	Collaborate as a member of an inter professional team.				
16	Formulates clinical questions and retrieves evidence to advance patient care				
17	Identifies system failures and contributes to a culture of Safety and Improvement.				
	Signature of the resident				
	Signature faculty				
	Signature of the HOD				

THIRD YEAR OF THE RESIDENCY

		7thquarter		8thquarter	
s.no	**Radio diagnosis**	**Resident**	**Faculty**	**Resident**	**Faculty**
1	Obtain a history & perform a physical examination adapted tothe patient is clinical condition.				
2	Triages and protocols exams.				
3	Interprets & reports X - ray examinations and priorities a DD.				
4	Performs & reports contrast Procedures.				
5	Performs USG examinations (abdomen including pelvis, Obstetrics).				
6	Performs & reports Doppler examinations.				
7	Interprets CT examinations.				
8	Interprets MRI examinations.				
9	Interprets Mammogram examination.				
10	Obtain informed consent and performs image glinded diagnostic / Interventions procedures.				
11	Communicates Diagnostic imaging findings.				
12	Recommends appropriate next steps.				
13	Manages patient after imaging procedures.				
14	Collaborate as a member of an inter professional team.				
15	Behaves Professionally.				
16	Formulates clinical questions and retrieves evidence to advance patient care				
17	Identifies system failures and contributes to a culture of Safety and Improvement.				
	Signature of the resident				
	Signature faculty				
	Signature of the HOD				

Annexure : 2. Postgraduate Students Appraisal Form
Sri Balaji Vidyapeeth
Department of Radiodiagnosis

POSTGRADUATE STUDENTS APPRAISAL FORM

Name of the Resident: ..... UIN No.:

Period of Training FROM ..... To .....

Sr. No.	PARTICULARS	Not Satisfactory	Satisfactory	More Than Satisfactory	Remarks
1.	Journal based / recent advances learning				
2.	Patient based /Laboratory or Skill based learning				
3.	Self directed learning and teaching				
4.	Departmental and interdepartmental learning activity				
5.	External and Outreach Activities / CMEs				
6.	Thesis / Research work				
7.	E-portfolio 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**

ANNEXURE a3: Multi source feedback

EVALUATION SHEET FOR POSTGRADUATE CLINICAL WORK
(To be completed by respective Unit Head)

Name of the Resident: ..... UIN No.:

Name of the Respondent: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	History taking and physical examination	Below par (1)	At par (2)	Above par (3)
2	Regularity and punctuality			
3	Ability to identify patient's problems			
4	Patient management skills			
5	Procedural skills / range of clinical technical skills			
6	Self directed learning			
7	Communication skills			
8	Proper and complete documentation			
9	Relationship with peers			
10	Works constructively in the health care system			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			

ANNEXURE 3b:

EVALUATION SHEET FOR POSTGRADUATE CLINICAL WORK
(To be completed by Nurse / Technician / Other Health Professionals)

Name of the Resident: ..... UIN No.:

Name of the Respondent: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	Shows a caring attitude to patients	Below par (1)	At par (2)	Above par (3)
2	Is respectful towards patients			
3	Shows no prejudice in the care of patients			
4	Communicates effectively with patients			
5	Empathetic counselling of patient's relatives			
6	Communicates effectively with colleagues			
7	Communicates effectively with other health professionals			
8	Allows them to express their doubts or concern regarding clinical decisions			
9	Proper and complete documentation			
10	Works constructively in the health care system			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			

ANNEXURE 3c:

EVALUATION SHEET FOR POSTGRADUATE CLINICAL WORK
(To be completed by Patient/Relative)

Name of the Resident: ..... UIN No.:

Name of the Respondent: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	Shows a caring attitude to patients	Below par (1)	At par (2)	Above par (3)
2	Is respectful towards patients			
3	Shows no prejudice in the care of patients			
4	Communicates effectively with patients			
5	Empathetic counseling of patient's relatives			
6	Effectively counsels patients preoperatively and postoperatively			
7	Takes religious and social considerations into account when making decisions			
8	Allows patients to make an informed decision regarding management and allows them to express their doubts and concerns			
9	Takes financial situation of patient into consideration when making decisions			
10	Discusses each step of the management with the patient and relatives			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			

ANNEXURE 3d:
EVALUATION SHEET FOR POSTGRADUATE CLINICAL WORK
(To be completed by Peer)

Name of the Resident: ..... UIN No.:

Name of the Faculty: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	Shows a caring attitude to patients	Below par (1)	At par (2)	Above par (3)
2	Is respectful towards patients			
3	Shows no prejudice in the care of patients			
4	Communicates and counsels effectively patients and patient's relatives			
5	Critically evaluates and uses patient outcomes to improve patient care			
6	Communicates effectively with colleagues			
7	Communicates effectively with other health professionals			
8	Acknowledges gaps in personal knowledge and expertise, and frequently asks for feedback			
9	Regularity and punctuality of attendance			
10	Works constructively in the health care system			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			

Annexure 4:Work Place Based Assessment (WPBA)
Sri Balaji Vidyapeeth
Department of Radiodiagnosis
EVALUATION SHEET FOR POSTGRADUATE (WPBA)

Name of the Resident: ..... UIN No.:

Name of the Faculty: ..... Date: .....

Designation :

No. of Mini-CEX Observed:

Clinical setting New / Follow up :

Clinicalproblem:_____

Complexity of the case:_____

No. of times patient seen by the student :_____

	Below expectation	Borderline	Meet expectation	Above expectation	Not observed
History taking skill					
Physical examination skill					
Communication skill					
Clinical judgement					
Professionalism					
Organisational efficiency					
Overall clinical care					
Anything good:			**Suggestions for improvement:**		
Agreed upon action:					
Signature of the resident			**Signature of the Accessor**		

Annexure 5

Sri Balaji Vidyapeeth

EVALUATION SHEET FOR POSTGRADUATE JOURNAL CLUB

(To be marked individually by each faculty)

Name of the Resident: ..... UIN No.:

Name of the Faculty: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	Relevance of article chosen	Below par (1)	At par (2)	Above par (3)
2	Identifies the problem addressed in the paper			
3	Completeness of presentation			
4	Analyses and gives comments on methodology and statistics			
5	Brief summary of results			
6	Comparison of work with other published work			
7	Merits and demerits of the paper			
8	Summary and take home message			
9	Time management			
10	Overall performance – relevant answers to questions, attitude during presentation and confidence			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			

Annexure 6:

Sri Balaji Vidyapeeth

EVALUATION SHEET FOR POSTGRADUATE SEMINAR

(To be marked individually by each faculty)

Name of the Resident: ..... UIN No.:

Name of the Faculty: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	Introduction of subject and its importance / Objectives	Below par (1)	At par (2)	Above par (3)
2	Completeness of presentation			
3	Cogency of presentation			
4	Consulted all relevant literature			
5	Use of audio-visual aids			
6	Understanding of subject			
7	Summary and take home message			
8	Cites appropriate references / suggests further reading			
9	Time management			
10	Overall performance – relevant answers to questions, attitude during presentation and confidence			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			

Annexure 7

Sri Balaji Vidyapeeth

EVALUATION SHEET FOR POSTGRADUATE CASE PRESENTATION

(To be marked individually by each faculty)

Name of the Resident: ..... UIN No.:

Name of the Faculty: ..... Date: .....

Sl. No.	Criteria to be assessed	Score		
1	Logical order in presentation (History taking)	Below par (1)	At par (2)	Above par (3)
2	Cogency of presentation			
3	Accuracy and completeness of general and local physical examination			
4	Other systemic examination			
5	Summarizes the based on imaging findings case and analyses the appropriate differential diagnoses			
6	Whether the diagnosis follows logically from history and relevant imaging findings			
7	Investigations required :Completeness of list, relevant order, interpretation of investigations			
8	Management principles and details			
9	Time management			
10	Overall performance – relevant answers to questions, attitude during presentation and confidence			
		Total score:		
	General Comments:			
	Highlights in performance (strengths)			
	Possible suggested areas for improvement (weakness)			
	Signature:			