PACIFIC MEDICAL UNIVERSITY, UDAIPUR

Ph.D. Entrance Syllabus: Radio-diagnosis

Basic Sciences Applied to Radiology

Foundational principles essential for radiological practice and research:

Physics of Radiology

- Atomic structure and ionizing radiation
- X-ray production and properties
- Interaction of radiation with matter
- Radiation units and measurements
- Radiation protection and safety (ALARA principle)
- Quality assurance and control

Radiobiology

- Cellular effects of radiation
- DNA damage and repair
- Deterministic and stochastic effects
- Tissue radiosensitivity
- Radiation effects on fetus and children

Imaging Technology & Instrumentation

- X-ray tubes and image receptors
- Image intensifiers and flat-panel detectors
- Digital radiography and PACS
- CT scanner components and generation types
- MRI hardware and magnet types
- Ultrasound transducers and Doppler principles

Imaging Modalities

□ Conventional Radiology

- Chest radiography
- Skeletal imaging
- Gastrointestinal contrast studies

- Genitourinary contrast studies
- Pediatric radiography

Ultrasonography & Doppler

- Physics of ultrasound
- Abdominal ultrasound
- Obstetric and gynecologic ultrasound
- Pediatric ultrasound
- Color Doppler and spectral Doppler

Computed Tomography (CT)

- CT physics and reconstruction algorithms
- Contrast media in CT
- CT angiography
- Multidetector CT
- Radiation dose optimization

Magnetic Resonance Imaging (MRI)

- MRI physics (T1, T2, proton density)
- MRI sequences and artifacts
- MR angiography
- Functional MRI and diffusion imaging
- Safety in MRI

Nuclear Medicine

- Principles of radionuclide imaging
- PET-CT and SPECT
- Radiopharmaceuticals
- Radiation safety in nuclear medicine

System-wise Radiology

□ Chest & Cardiovascular Imaging

- Lung infections and neoplasms
- Interstitial lung diseases
- Mediastinal masses

- Congenital and acquired heart diseases
- CT coronary angiography

Neuroradiology

- Brain tumors
- Stroke imaging
- CNS infections
- Spinal imaging
- Pediatric neuroradiology

Musculoskeletal Radiology

- Bone tumors
- Trauma imaging
- Arthropathies
- Metabolic bone diseases
- Sports injuries

Abdominal Radiology

- Hepatobiliary imaging
- Pancreatic diseases
- Gastrointestinal tract imaging
- Retroperitoneal pathology

Genitourinary Imaging

- Renal and adrenal imaging
- Urinary tract obstruction
- Male and female pelvic imaging
- Obstetric imaging

Breast Imaging

- Mammography
- Breast ultrasound
- Breast MRI
- BI-RADS classification

Interventional Radiology

- Vascular and non-vascular interventions
- Image-guided biopsies and drainages
- Angiography techniques
- Embolization procedures
- Interventional oncology
- Complications and post-procedure care

Contrast Media & Imaging Safety

- Iodinated contrast agents
- Gadolinium-based contrast agents
- Adverse reactions and management
- Nephrogenic systemic fibrosis
- Patient preparation and consent

Radiation Protection & Safety

- Radiation hazards
- Protective devices
- Dose limits for patients and workers
- Regulatory bodies (AERB)
- Ethical considerations in radiology

Recent Advances in Radio-Diagnosis

- Artificial intelligence in radiology
- Dual-energy CT
- Hybrid imaging (PET-MRI)
- Elastography
- Molecular imaging