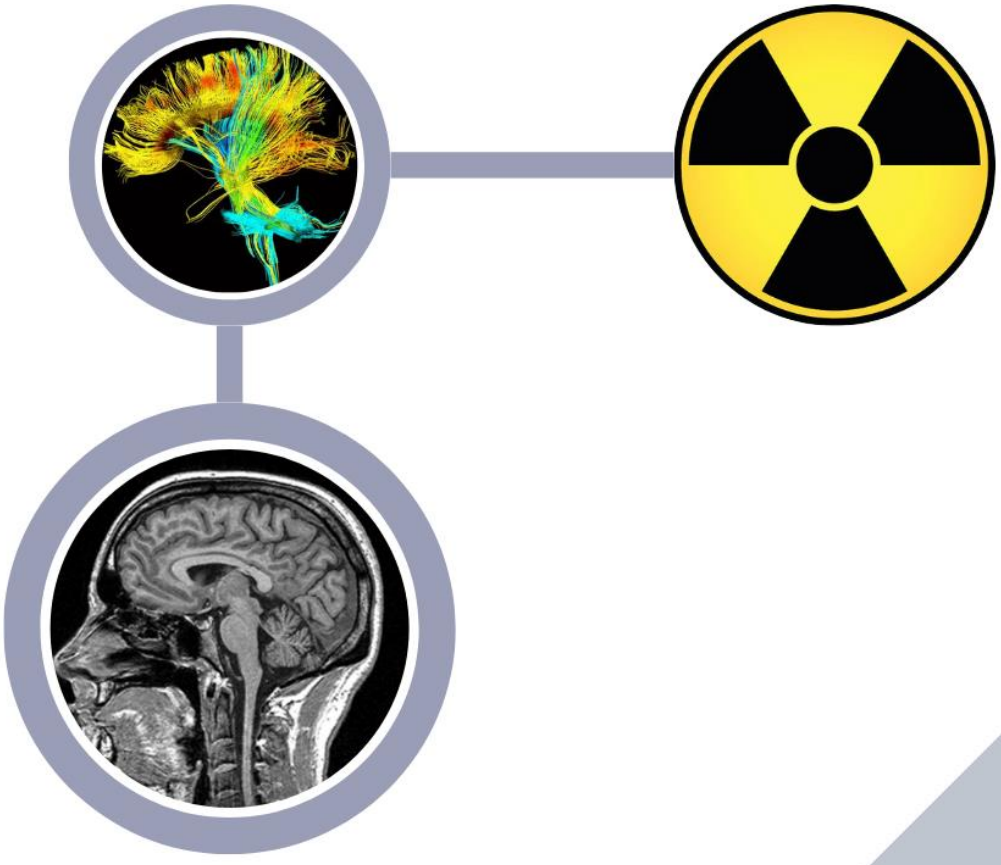
MANUAL FOR CANDIDATES & SUPERVISORS

Master of Medicine (Radiology)

PPSP/PG/RAD/CP1/IR1



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SCHOOL'S MISSION

TO PROVIDE A GLOBALLY-RECOGNISED AND LOCALLY-EFFECTIVE MEDICAL EDUCATION AND HEALTH CARE THAT ADHERES TO THE HIGHEST STANDARDS AND TO LEAD TRANSLATIONAL RESEARCH FOR A SUSTAINABLE ECOSYSTEMS.

USM'S VISION

"TRANSFORMING HIGHER EDUCATION FOR A SUSTAINABLE TOMORROW"

USM'S MISSION

USM IS A PIONEERING, TRANSDISCIPLINARY RESEARCH-INTENSIVE UNIVERSITY THAT EMPOWERS FUTURE TALENTS AND ENABLES THE BOTTOM BILLIONS TO TRANSFORM THEIR SOCIO-ECONOMIC WELL-BEING

UNIVERSITI SAINS MALAYSIA

QUALITY POLICY FOR MS ISO9001:2015

School of Medical Sciences will strive to be a center of academic excellence by providing the highest standards of medical education and research activity and will continually improve the effectiveness of the quality management.

The quality policies specific to the relevant areas are as follows

1. We will provide a teaching-learning approach for undergraduate medical students using the SPICES model; i.e. Student-centered, Problem-based, Integrated, Community oriented, Elective and Systematic and Spiral.
2. We will provide structured postgraduate vocational programs where individual performance is closely supervised and continuously monitored. We will facilitate the development of academic and administrative personnel by providing knowledge and skills enhancement opportunities.
3. We will provide effective research proposal reviewing process to facilitate grant approval.

The School of Medical Sciences aims to be a center of excellence in academic and research in the country. To achieve this aspiration, we plan and manage our School through client-focus activities and provision of excellent design and development of education programs and provision of education services (with the adoption of effective and innovative teaching and learning curriculum and techniques as well as continuous quality improvement and accreditations) and management of research. The staff of PPSP shall acquire and implement the skills and expertise rendered. Adopting professionalism in imparting knowledge and training of our students will make our ambition a reality.

POLISI KUALITI MS ISO9001:2015

Pusat Pengajian Sains Perubatan akan berusaha untuk menjadi sebuah pusat akademik yang cemerlang dengan menyediakan aktiviti pengajian perubatan dan penyelidikan paling berprestasi di samping memperbaiki pengurusan kualiti secara berterusan.

Polisi kualiti berkaitan dengan bidang yang tertentu adalah seperti berikut,

1. Kami menyediakan pendekatan pengajaran-pembelajaran bagi pelajar prasiswazah menggunakan model SPICES; iaitu 'Student-centred, Problem-based, Integrated, Community-oriented, Elective and Systematic and Spiral'.
2. Kami menyediakan program vokasional pascasiswazah berstruktur di mana prestasi setiap pelajar akan diselia dengan teliti dan dipantau secara berterusan. Kami akan mempermudahkan perkembangan akademik dan pengurusan kakitangan melalui peluang mempertingkatkan pengetahuan dan kemahiran.
3. Kami juga menyediakan proses semakan penyelidikan yang efektif bagi mempermudahkan mendapat kelulusan geran.

Pusat Pengajian Sains Perubatan (PPSP) bermatlamat menjadi pusat akademik dan penyelidikan paling cemerlang dalam negara. Bagi mencapai aspirasi tersebut, kami merancang dan menguruskan pusat pengajian melalui aktiviti berfokuskan klien, peruntukan kecemerlangan dari segi reka bentuk dan program pendidikan dan juga peruntukan servis pendidikan (dengan mengguna-pakai kurikulum pengajaran dan pembelajaran dan juga teknik yang berkesan dan berinovasi di samping peningkatan kualiti dan akreditasi secara berterusan) dan pengurusan penyelidikan. Kakitangan PPSP berusaha mendapat dan mengguna-pakai kemahiran yang diberikan. Penerapan amalan profesionalisme dalam menyampaikan ilmu dan latihan kepada pelajar akan menjadikan cita-cita kami satu realiti.

UNIVERSITI SAINS MALAYSIA

QUALITY OBJECTIVES

SCHOOL OF MEDICAL SCIENCES

The quality policy identified above is further supported by defined measurable quality objectives (as below). Respective Deputy Deans shall continuously monitor and ensure that the objectives are achieved.

Undergraduate:

1) To ensure at least 50% of graduated students achieve CGPA of 3.00 and above.
2) To ensure at least 90% of undergraduate students in professional examinations pass their examination.

Postgraduate:

1) Ratio of the postgraduate students to eligible lecturers is not more than 4 to 1.
2) At least 75% of eligible lecturers to be the main supervisor for research / dissertation to a minimum of one postgraduate student.
3) Percentage of international postgraduate students in coursework mode is at least 2%.
4) Percentage of international postgraduate students in mixed-mode and research-mode coursework is at least 10%.
5) At least 20% of PhD candidates submit their thesis within 7 semesters.
6) At least 35% of M. Med candidates graduate within 8 semesters.
7) At least 15% of MSc (research mode) candidates submit their thesis within 4 semesters.

Research:

1) At least 60% of eligible lecturers will be involved in research as Principal Investigators.
2) At least 75% of eligible lecturers publish at least one paper in the indexed journal as main author or corresponding author.

OBJEKTIF KUALITI

PUSAT PENGAJIAN SAINS PERUBATAN

Polisi kualiti yang tersebut disokong dengan lebih lanjut oleh objektif kualiti yang boleh diukur (seperti di bawah). Timbalan Dekan yang berkenaan perlu membuat pemantauan secara berterusan bagi memastikan setiap objektif akan tercapai.

Prasiswazah:

1) Memastikan sekurang-kurangnya 50% pelajar yang bergraduat mencapai PNGK 3.00 ke atas.
2) Memastikan sekurang-kurangnya 90% pelajar prasiswazah dalam peperiksaan profesional lulus peperiksaan mereka.

Pascasiswazah:

1) Nisbah pelajar pascasiswazah kepada pensyarah yang berkelayakan tidak melebihi 4 kepada 1.
2) Sekurang-kurangnya 75% pensyarah yang berkelayakan menjadi penyelia utama penyelidikan atau disertasi bagi sekurang-kurangnya seorang pelajar pascasiswazah.
3) Peratus pelajar antarabangsa dalam mod kerja kursus adalah sekurang-kurangnya 2%.
4) Peratus pelajar antarabangsa dalam mod campuran dan mod penyelidikan adalah sekurang-kurangnya 10%.
5) Sekurang-kurangnya 20% calon PhD menghantar tesis mereka dalam tempoh 7 semester.
6) Sekurang-kurangnya 35% calon Sarjana Perubatan bergraduat dalam masa 8 semester.
7) Sekurang-kurangnya 15% calon MSc (mod penyelidikan) menghantar tesis mereka dalam tempoh 4 semester.

Penyelidikan:

1) Sekurang-kurangnya 60% pensyarah yang berkelayakan akan terlibat dengan penyelidikan sebagai Penyelia Utama.

2) Sekurang-kurangnya 75% pensyarah yang berkelayakan menerbitkan sekurang-kurangnya satu artikel penyelidikan dalam jurnal berindeks sebagai penulis utama atau penulis koresponden.

PREFACE

We welcome you to the Department of Radiology, Universiti Sains Malaysia (USM). We would like to express our heartiest appreciation for choosing Radiology as your career advancement. You have made the right choice indeed. Congratulations on being selected into the Master of Medicine (Radiology) programme, USM.

The Master of Medicine (Radiology), USM was first started in 1996. The main training centre is Hospital Universiti Sains Malaysia (HUSM). Since then, a good number of radiologists have graduated. Most of them still practice under the Ministry of Health (MOH), some joined the private practice, and a few continue as academia. This master programme is now part of the national conjoint programme with Universiti Malaya (UM), Universiti Kebangsaan Malaysia (UKM), International Islamic University of Malaysia (IIUM), Universiti Putra Malaysia (UPM), Kumpulan Pakar Johor University College (KPJUC), and most recently Universiti Teknologi MARA (UiTM). The syllabus and examination of the programme are conducted by the Conjoint Board of Postgraduate Training in Radiology. The full conjoint programme has been established in the year 2012.

USM maintains a close tie with Hospital Raja Perempuan Zainab II, Kota Bharu (HRPZ II), Hospital Tunku Azizah, Kuala Lumpur, Hospital Selayang, and Institut Kanser Negara (IKN) as part of the training hospitals for our candidates. In Hospital Selayang, the students (especially out-campus) are mainly exposed to interventional hepatobiliary procedures. In Hospital Tunku Azizah, they are exposed to paediatric radiology. The students (especially in-campus) are exposed to the general public cases at HRPZ II.

In 2004, USM is the first radiology training centre embarked onto the distant learning programme, fondly known as 'Pendidikan Jarak Jauh' (PJJ). The main objective of this is to alleviate the problem of shortage of medical officers in MOH hospitals. Close collaboration is fostered between the MOH consultants and our academic staff. It requires the candidates to attach for 2 years in the accredited MOH hospital and another 2 years in the campus. This is reaching almost 18 years; certainly, it is a matured programme and proved its encouraging outcome. The advancement of computer and communication technology such as e-learning and tele-radiology applications, has facilitated and improved the mode of teaching and learning in PJJ.

The fraternity of radiology in HUSM has also expanded with various sophisticated facilities, which include multi-detector computed radiography (MDCT), digital fluoroscopy, magnetic resonance imaging (MRI), nuclear imaging, mammography, ultrasound, digital subtraction angiography and bone densitometry. With all the facilities, we ensure the candidates are equipped with necessary skills and knowledge to become safe and competent radiologists. It is proud to share that USM has exclusively been granted APEX in 2009 with the theme of "Transforming Higher Education for a Sustainable Tomorrow".

Finally, we acknowledge our former academia for their continuous enthusiasm, commitment and support to make sure this programme succeeds and sustain to be one of the best. Their invaluable contribution is the key to the current success.

Head of Department
01st November 2022

COURSE PHILOSOPHY

Generally, the course is organised based on multidisciplinary and integrated organ system with problem-based learning approach, which is a unique approach in USM.

The curriculum focuses on the aspect of accepting patients as a whole in term of individual, family and community. The aim is to create awareness on full medical responsibilities with regards to the development of better understanding in health care and continuous medical education.

The concept of competent radiologists upon graduation, which is adopted by the school, should have adequate knowledge and skill to enable them to solve problems related to individual and community.

The graduates are expected:

a) To have a better understanding on the applications of basic medical science in the care of patients.

b) To acquire satisfactory clinical competencies on the aspects below:

   Good attitude and communication skill for the interaction and planning of treatment for patients.

   i. Able to obtain a complete clinical history
   ii. Able to perform proper radiological examinations
   iii. Able to make an accurate diagnosis on general and acute medical problems for further appropriate management and referral

c) To have a better understanding on the patients' custom and culture for the purpose of planning and providing a complete treatment.

d) To understand the roles and responsibilities as a leader in providing health care education to the community.

e) To be able to apply the acquired and disseminate knowledge for the future medical advancement.

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1. OBJECTIVES OF THE PROGRAMME

1.1 GENERAL OBJECTIVE

Provide training to medical doctors who are interested in becoming specialists in diagnostic radiology. He/she must acquire the knowledge and skills with appropriate attitude to function as a consultant in the practice of clinical radiology and be able to conduct comprehensively on all aspects of patient's management.

1.2 SPECIFIC OBJECTIVES

The pre-requisite for this training includes adequate knowledge of basic medical science and clinical medicine; has clinical experience (practice) in various medical disciplines and patient care. The specific objectives of this program are:

1.2.1 To acquire adequate knowledge on the understanding of basic radiological sciences including radiology physics, radiology anatomy, radiographic and radiological procedures, ionizing radiation, radiation hazards, radiation protection and safety; radionuclide and nuclear imaging; computer and information technology; and radiological equipment.

1.2.2 To enhance understanding in pre-clinical medicine and clinical medicine knowledge including correlation of the clinical presentations and pathophysiology with radiological manifestations.

1.2.3 To acquire knowledge of the disease and its radiological features.

1.2.4 To comprehend the various applications of imaging techniques available, their indications and limitations; recognise the complications that can occur as a result of improper usage; and provide an effective preventive role and management.

1.2.5 To gain technical skills in performing various imaging techniques and procedures for diagnostic as well as therapeutic, including operate the radiology equipment.

1.2.6 To obtain the skills to interpret the findings of the radiological examinations in relation to disease process.

1.2.7 To enhance the decision-making process in establishment of radiological diagnoses (based on clinical presentations and radiological findings).

1.2.8 To brighten the communication skills with respect to radiology field.

1.2.9 To recognise and relate that an individual patient can have multiple health problems which may be due to psychological, social, cultural as well as environmental and biological factors.

1.2.10 To practise proper professional ethics. This understanding is brought about through the introduction of medical ethics, concept and philosophy of sickness and ill health and the proper role of health workers.

1.2.11 To augment the scientific and research methods.

1.3 GENERAL OUTCOMES

The expected competencies that the candidates should exhibit on graduation in relation to training and future role as specialist in radiology (Radiologist)

1.3.1 Able to understand and utilise the knowledge of basic radiological sciences and clinical radiology to solve clinical problems.

1.3.2 Able to perform various diagnostic imaging techniques and procedures and some of the therapeutic (interventional) procedures independently with rational and cost effective; and to operate the radiology equipment with efficient and safety.

1.3.3 Able to identify and interpret the radiological findings and establish the radiological diagnoses with high accuracy and give expert opinion on patient's management.

1.3.4 Able to make a report of the radiological examination and communicate with medical colleagues verbally as well as in written with clear and timely manner.

1.3.5 Demonstrate a proper behaviour and professional ethics that reflect the medical profession and awareness of his/her responsibility towards the patient and the needs of society.

1.3.6 Able to construct a research proposal, conduct a research, and perform analytical and critical thinking.

1.4 ACADEMIC CONTROL, IMPLEMENTATIONS AND INTERPRETATION

1.4.1 The design of the curriculum is subject to revision by the academic staff of the department. Academic staff of the department are responsible for the entire curriculum and the teaching methodology.

1.4.2 Academic staff of the department have liberty to allocate the resources necessary for its implementation.

1.4.3 Any point that is ambiguous or not clearly herein will be decided by the University Senate on the advice of the School Board. All the information stated in this booklet is subject to change from time to time.

2. STRUCTURE OF THE PROGRAMME

This program is a full-time coursework, which is divided into three phases with horizontal (concurrent) and vertical (sequential) integration of curricular components.

2.1 CURRICULUM MODELS

a. Multidisciplinary
b. Organ system-based
c. Problem-based

2.2 LEARNING METHODS

Candidates are encouraged to acquire knowledge and skills through various methods (multimode) with focus on self-directed learning. These methods include:

a. Seminar / Tutorial
b. Group Discussion / Clinico-Radiological Conferences
c. Practical
d. Film Reporting Session / Consultation
e. e-Learning
f. Self-reading

2.3 DURATION OF STUDY

The duration of the course is four (4) years.

The course is divided into three (3) phases:
Phase I – Year 1
Phase II – Year 2 and 3
Phase III – Year 4

However, under certain circumstances the duration may be extended up to a maximum period of seven (7) years. For every examination year, candidates are allowed a maximum of three (3) attempts.

2.4 PLACE OF TRAINING AND POSTING

The school may on the recommendation of the department for the candidate's program of study permit candidates to undertake part of training program in another recognised institution(s).

a. Close System

Candidates will be placed in HUSM throughout the period of study. However, candidates in Phase I must undergo 3 months posting in Hospital Raja Perempuan Zainab II, Kota Bharu (subject to change). For Phase II, candidates must undergo 3 months posting in Hospital Raja Perempuan Zainab II, Kota Bharu (subject to change) and another 3 months rotation in Hospital Tunku Azizah (10 weeks)/ Institut Kanser Negara (IKN) (2 weeks).

b. Open System

Candidates will be placed in affiliated KKM hospital for two years; and in HUSM for the remaining 2 years. Candidates will also be posted at the nearest KKM hospitals for nuclear medicine and angiography training if such facilities are not available in the hospitals where the candidates are placed.

2.5 COMPOSITION

This program basically has three major components, which are running concurrently:

1. Theory
2. Clinical
3. Scientific method

2.5.1 PHASE I

Phase I covers basic radiological sciences and clinical radiology. The content of basic radiological sciences is divided into nine (9) broad categories

1. Contrast media, radioisotope and drugs in radiology
2. Fundamentals of physics in radiology
3. Radiographic and radiological techniques
4. Radiology anatomy
5. Physiology relevant to imaging
6. Pathological correlation of altered radiological patterns
7. HIS, RIS and PACS in radiology
8. Clinical radiology, which is limited to trauma of the upper and lower limbs
9. Introduction to research in radiology

2.5.2 PHASE II

Phase II covers clinical radiology, intermediate advanced physics and medical ethics. Research methodology and biostatistics is organised by the school.

2.5.3 PHASE III

Phase III covers advanced clinical radiology, management and quality in radiology and scientific writing. The candidate will be placed as a 'consultant-in-training' and will be expected to function independently in resource and patient management.

2.6 THE LEVEL OF COMPETENCY BY PHASE

The outcomes are defined in terms of competency in three broad categories; including knowledge, skills (with respect to technical skills, judgment or decision-making skills, and communication skills in radiology) and attitude.

2.6.1 PHASE I

a. Knowledge

At the end of phase, candidates should be able to acquire knowledge on

i. projection and cross-section anatomical on various imaging modalities including normal variants
ii. radiographic and radiological techniques
iii. contrast media, radioisotopes and drugs used in radiological procedures
iv. basic physics and radiation protection
v. fundamental information and communication technology (ICT) and its applications
vi. pathological process and relate with radiological changes

b. Skills

At the end of phase, candidates should be able to

i. perform simple procedures such as barium and contrast studies with minimal supervision
ii. assist more complicated/invasive procedure (e.g. myelogram, venography, arteriography, drainage, biopsy)
iii. determine the appropriate radiological examination for patient based on clinical information
iv. evaluate the acceptability of radiographic images and adequacy of radiological procedure including the need for repeat examination
v. perform clear and effective verbal communication with patients and radiology colleagues

c. Attitude

At the end of phase, candidates should be able to

i. inculcate sense of responsibility
ii. empathy to the patients and their family

2.6.2 PHASE II

a. Knowledge

At the end of phase, candidates should be able to acquire

i. knowledge of common radiological features of the disease on various imaging modalities
ii. sound knowledge in the rationale of using the different imaging modalities
iii. advanced knowledge on radiological physics
iv. acquire basic knowledge of research principles, methodologies and statistical analysis, and prepare the research proposal
v. awareness of patient's privacy, confidentiality, dignity and their rights

b. Skill

At the end of phase, candidates should be able to

i. perform simple diagnostic radiological procedure without supervision
ii. perform more complicated/invasive diagnostic procedures with minimal supervision (e.g. arteriography, venography, arteriography, aspiration and biopsy)
iii. assist interventional procedures under close supervision (e.g. stenting, nephrostomy, PTBD, drainage)
iv. identify and describe the abnormal radiological findings, perform analysis on findings to reach the diagnosis/diagnoses and prepare a written report
v. decide on urgent condition and time to alert the referring doctor
vi. participate in discussion during clinico-radiological conference
vii. perform clear and effective verbal communication with patient, radiology colleague, radiologist and reference doctor

c. Attitude

At the end of phase, candidates should be able to determine his/her limitation and cases/condition require assistance with senior colleague or consultant radiologist

2.6.3 PHASE III

a. Knowledge

At the end of phase, candidates should be able to acquire knowledge on

i. rare radiological features of the disease on various imaging modalities.
ii. radiological physics.
iii. management skills in radiology.
iv. quality and standard of practice and career paths.

b. Skill

At the end of phase, the candidate should be able to

i. perform diagnostic radiological procedures without supervision.
ii. perform level I and II interventional procedures with minimal supervision (e.g. simple and complex image-guided biopsy, simple and complex image-guided drainage, vascular access etc).
iii. assist more complicated level III, IV and V interventional procedures (e.g. radiofrequency ablation, vertebroplasty, embolization, etc).
iv. identify, perform analysis and conclude the radiological findings in all cases upon completion of report.
v. decide the need for further radiological examination or procedure.
vi. chair the clinico-radiological conference.
vii. lead his/her team to complete the task and utilise the resources in the most productive and cost-effective ways.
viii. perform clear and effective verbal communication and good interpersonal relationship with patient, radiology colleague, radiologist and reference doctor.

c. Attitude

At the end of phase, candidates should be able to

i. determine his/her limitation and cases/condition require assistance with consultant radiologist for second opinion.
ii. demonstrate proper behaviours and professional ethics that reflect the medical profession and awareness of his/her responsibility towards the patient and society.

2. 7 ASSESSMENTS

Assessment consists of two (2) elements

1. Continuous assessment
2. End of phase examination

Detail is explained in section 4

3. LEARNING CONTENT

3.1 PHASE I

3.1.1 Contrast Media, Isotope and Drugs in Radiology

a. Contrast media
   i. Oral contrast media
   ii. Intravenous iodinated contrast media – LOCM and HOCM
   iii. MR contrast media
   iv. Ultrasound contrast media
   v. Adverse effects of contrast media and management

b. Radioisotope
   i. Radioisotopes
   ii. Radiopharmaceuticals

c. Drugs
   i. Drugs used in resuscitation:
      - Adrenaline
      - Amiodarone
      - Atropine
      - Chlorphenamine
      - Hydrocortisone
      - Aminophylline
   ii. Drugs used for sedation:
      - Midazolam
      - Chloral hydrate
      - Fentanyl
      - Pethidine
   iii. Drugs used for procedures:
      - Hyoscine-N-butylbromide
      - Glucagon
      - Metoclopramide
      - Heparin

d. Emergency Management

3.1.2 ICT and Applications in Radiology

a. Fundamental ICT
b. Digital image
c. Basic networking
d. Standard - DICOM and HL7
e. PACS, RIS, tele-radiology and image post-processing
   i. Image acquisition systems
   ii. Image storage and archiving
   iii. Retrieval, networking and communication
   iv. Workstation, display, image processing

3.1.3 Basics Physics of Radiology

a. Fundamental physics and radioactivity
    i. Basic quantities & units
    ii. Atomic structure
    iii. Electromagnetic radiation
    iv. Wave & particle characteristics, Inverse Square Law
b. Production of X-rays
    i. X-ray tube – essential components
    ii. Bremsstrahlung radiation
    iii. Characteristic radiation
    iv. Exposure technique factors
    v. X-Ray spectrum
c. Interaction of X-rays and gamma rays with matter and their effects on irradiated materials
    i. Effects on irradiated materials
    ii. Coherent scattering
    iii. Photoelectric process
    iv. Compton scatters
    v. Attenuation of x-rays – absorption vs. scatter
    vi. Exponential law, monochromatic vs. polychromatic
    vii. Linear attenuation coefficient, HVL, filtration
    viii. Effects and control of scatter, collimators, grids
d. Radiation Detection & Measurement
    i. Exposure and exposure rate meters
    ii. Gas-filled radiation detectors
    iii. Ionisation chamber
    iv. Proportional counter
    v. Geiger – Mueller counter
    vi. Scintillation detector, photomultiplier tubes
    vii. Semiconductor detector
    viii. Thermoluminescent dosimeters
    ix. Film dosimetry
e. Projection Radiography
    i. Film/Screen Radiography - intensifying screen, photographic film
    ii. Digital concept
    iii. Digital image, resolution, matrix size, information content
    iv. Digital systems – direct and indirect radiography
    v. CR
    vi. DR
f. Image Quality & Faults
    i. Geometric factors
    ii. Resolution
    iii. Contrast
    iv. Noise
    v. Digital image quality, artefacts
g. Radiation protection
    i. Sources of radiation
    ii. Radiation quantities and units
    iii. Biological effects (stochastic & deterministic effects)

iv. ICRP, NCRP recommendations, AELB Act 304
v. Radiation protection principles
vi. ALARA principles
vii. Classification of work area
viii. Dosimetry (personnel & patient)
ix. Protection of patient, staff, public
x. Specific procedures
xi. Safe handling of radioactive materials

h. II – TV Systems
   i. Fluoroscopy – image intensifier, television
   ii. Digital Subtraction Angiography – basic principles, subtraction techniques

i. Mammography
   i. Basic principles
   ii. Imaging characteristics
   iii. X-Ray tube – anode material, focal spot
   iv. Film /screen system – single vs. double
   v. Radiation dosimetry – average glandular dose

j. Computed Tomography
   i. Basic principles
   ii. Instrumentation – 3rd & 4th generates scanners, helical, multi-slice technique
   iii. Image acquisition & reconstruction – CT #, reconstruction algorithms
   iv. Beam hardening, partial volume effects
   v. Image quality, artefacts
   vi. Image processing, windowing

k. Ultrasound imaging
   i. Fundamentals, wave properties
   ii. Interaction of US with tissue
   iii. Instrumentation, transducer – unfocused vs. focused beam
   iv. Overview of scanning modes
   v. Real time scanning
   vi. US image, resolution (axial & lateral), artefacts
   vii. Doppler US, PW vs. CW, colour flows imaging
   viii. Biological effects

l. Radionuclide imaging
   i. Radioactivity, exponential decay
   ii. Nuclear transformation, radioactive decay processes
   iii. Radio pharmacology
   iv. Radiopharmaceutical – desirable properties
   v. Preparation of radiopharmaceuticals
   vi. Gamma camera – principle and instrumentation
   vii. Planar imaging
   viii. Image quality
   ix. Performance characteristics, QC
   x. SPECT
   xi. Introduction to PET

m. Magnetic Resonance Imaging
   i. Fundamental principles, relaxation processes, T1, T2
   ii. Instrumentation
   iii. Basic imaging sequences

iv. Image acquisition, gradient fields
v. Imaging parameters
vi. MR image & artefacts
vii. MR angiography
viii. MR hazards & safety

n. Quality Assurance Programme/ Quality Control
i. QAP
ii. QC – Equipment
iii. QC – Processor

3.1.4 Respiratory System

a. Anatomy of respiratory system
i. Anatomy of the lungs, including segmental anatomy, bronchial tree, pleura, and thoracic cage as demonstrated by radiography, and cross-sectional imaging
ii. Vascular supply and drainage
iii. Normal variants

b. Radiological technique in respiratory system
i. Plain film techniques for imaging of the lungs of how variation in exposure factors influences the final image
ii. Cross-sectional imaging of the respiratory system
iii. Interventional procedures and complications

c. Radiology and radionuclide imaging for respiratory system
i. Technique and applications

d. Pathological correlation of altered radiological patterns in respiratory system
i. Opacities in the lung -calcification, nodules, mass, alveolar and interstitial
ii. Opacities in the pleura/cavity- calcification, fluid, blood, pus, effusion
iii. Lucency – uni/bilateral hyperlucency of lungs, subcutaneous emphysema
iv. Displacement of structures- mediastinal shift due to diaphragmatic hernia, lobectomy, pneumonectomy

3.1.5 Cardiovascular and Lymphatic System

a. Anatomy of cardiovascular and lymphatic system
i. Anatomy of the heart, coronary arteries, aorta, great vessels, vascular structures of the thorax and mediastinum, as demonstrated by radiography, contrast studies and cross-sectional imaging
ii. Anatomy of arterial, venous and lymphatic systems of the whole body
iii. Vascular supply and drainage of the heart
iv. Normal variants

b. Radiological technique in cardiovascular and lymphatic system
i. Plain film techniques for imaging of the heart, aorta with knowledge of how variation in exposure factors influences the final image
ii. Angiographic techniques for imaging of the aorta, great vessels, coronary arteries and peripheral vascular system
iii. Cross-sectional imaging of the cardiovascular and lymphatic system
iv. Contrast venography of arms, legs and central veins
v. Ultrasound imaging of peripheral arteries and veins, including Doppler imaging
vi. Interventional procedures and complications

c. Radiology and radionuclide Imaging for cardiovascular and lymphatic system
i. Technique and applications

d. Pathological correlation of altered radiological patterns process in cardiovascular and lymphatic system
    i. Changes in the shape and size of cardiac silhouette and chambers and great vessels
    ii. Calcification of valves and walls of the heart

3.1.6 Gastrointestinal System
a. Anatomy of gastrointestinal system
    i. Anatomy of the oropharynx, oesophagus, stomach, duodenum, small bowel and colon, as demonstrated by radiography, contrast studies and cross-sectional imaging
    ii. Anatomy of the peritoneum and retroperitoneum, as demonstrated by cross-sectional imaging
    iii. Vascular supply and drainage of the abdominal viscera, as demonstrated by ultrasound, CT, MR and angiography
    iv. Normal variants
b. Radiological technique in gastrointestinal system
    i. Plain film radiography of the abdomen
    ii. Contrast studies of the gastrointestinal tract
    iii. Cross-sectional imaging of the gastrointestinal tract and upper abdominal organs
    iv. Interventional procedures and its complications
c. Radiology and radionuclide imaging for gastrointestinal system
    i. Technique and applications
d. Pathological correlation of altered radiological patterns in gastrointestinal system
    i. Abnormal bowel gas distribution - displacement, gaseous distension, gasless abdomen, extraluminal gas, mural gas, fluid filled bowel
    ii. Non-visualisation/ displacement of fat planes of normal structures
    iii. Intra-abdominal calcification
    iv. Masses – cystic and solid
    v. Ascites
    vi. Wall thickening

3.1.7 Hepatobiliary System
a. Anatomy of hepatobiliary system
    i. Anatomy of the liver, gall bladder and biliary tree, pancreas and spleen as demonstrated by radiography, contrast studies and cross-sectional imaging
    ii. Vascular supply and drainage
    iii. Normal variants
b. Radiological technique in hepatobiliary system
    i. Techniques for imaging the hepatobiliary system, including ERCP and MRCP
    ii. Techniques for cross-sectional imaging of hepatobiliary system
    iii. Interventional procedures and complications
c. Radiology and radionuclide imaging for hepatobiliary system
    i. Technique and applications
d. Pathological correlation of altered radiological patterns in hepatobiliary system
    i. Change of texture, size of normal structures
    ii. Mass and nodule
    iii. Calcification
    iv. Lucency - gas in biliary tree
    v. Wall thickening

3.1.8 Genitourinary System

a. Anatomy of genitourinary system
    i. Anatomy of the urinary tract, male genital tract, as demonstrated by radiography, contrasts studies and cross-sectional imaging
    ii. Vascular supply and drainage
    iii. Normal variants
b. Radiological technique in genitourinary system
    i. Plain radiography technique of KUB and pelvis
    ii. Cross-sectional imaging of the genitourinary system
    iii. Contrast studies of genitourinary tract
    iv. Ultrasound techniques for examining the renal tract and male genital tracts, including endocavity examination of prostate and Doppler techniques
    v. Interventional procedures and complications
c. Radiology and radionuclide imaging for genitourinary system
    i. Technique and applications
d. Pathological correlation of altered radiological patterns in genitourinary system
    i. Changes in size, shape, number and texture of normal structures
    ii. Mass
    iii. Opacities, lucency and calcification
    iv. Wall thickening

3.1.9 Central Nervous System

a. Anatomy of central nervous system
    i. Anatomy of the skull and spine
    ii. Anatomy of the brain, spinal cord and meninges, including cerebral and spinal vascular anatomy, as demonstrated by radiography, contrast studies and cross-sectional imaging
    iii. Normal variants
b. Radiological technique in central nervous system
    i. Plain radiography of the skull and spine
    ii. Cross-sectional imaging of central nervous system
    iii. Imaging of the intracranial circulation
    iv. Contrast studies of central nervous system
    v. Interventional procedures and complications
c. Radiology and radionuclide imaging for central nervous system
    i. Technique and applications
d. Pathological correlation of altered radiological patterns in central nervous system
    i. Change in density, thickness, size and shape
    ii. Bone destruction
    iii. Abnormal contrast enhancement
    iv. Calcification
    v. Ventriculomegaly
    vi. Midline shift

3.1.10 ENT, Ophthalmology and Teeth

a. Anatomy of ENT, ophthalmology and teeth
    i. Anatomy of the ear, facial bones, the paranasal sinuses, teeth, pharynx, larynx as demonstrated by radiography, contrast studies and cross-sectional imaging

ii. Anatomy of the orbit including the lacrimal apparatus demonstrated by radiography, contrast studies and cross-sectional imaging
iii. Vascular supply and drainage
iv. Normal variants

b. Radiological technique in ENT, ophthalmology and teeth
i. Plain radiography of the paranasal sinuses, temporal bones, facial bones, teeth and orbit
ii. Cross-sectional imaging of the paranasal sinuses, temporal bones, facial bones, teeth and orbit
iii. Contrast studies of lacrimal ducts
iv. Interventional procedures and complications

c. Radiology and radionuclide imaging for ENT, ophthalmology and teeth
i. Technique and applications

d. Pathological correlation of altered radiological patterns in ENT, ophthalmology and teeth
i. Opacities and calcifications
ii. Enlarged optic foramen
iii. Bone changes
iv. Septal deviation
v. Prevertebral space widening
vi. Shift and compression of trachea

3.1.11 Musculoskeletal System

a. Anatomy of musculoskeletal system
i. Anatomy of the skeletons, including knowledge of the major ossification centres with times of fusion
ii. Cross-sectional imaging of the musculoskeletal system
iii. Vascular supply and drainage
iv. Normal variants

b. Radiological technique in musculoskeletal system
i. Plain film techniques for imaging of the skeletal system, including specific projection techniques
ii. Cross-sectional imaging techniques of the skeletal system and soft tissues
iii. Arthrography techniques, including CT and MR
iv. Interventional procedures and complications

c. Radiology and radionuclide imaging for musculoskeletal system
i. Technique and applications

d. Pathological correlation of altered radiological patterns in musculoskeletal system
i. Changes in density of bone
ii. Bone destruction
iii. Degenerative changes
iv. Arthritis changes
v. Fat plane displacement
vi. Widening of joint space
vii. Periosteal reaction
viii. Calcification and ossification
ix. Changes in MR signal intensity

e. Radiographic interpretation of upper and lower limbs trauma
i. Fracture, dislocation, subluxation

3.1.12 Endocrine System

a. Anatomy of endocrine system
    i. Anatomy of the adrenal glands, thyroid, parathyroid, and pituitary gland, as demonstrated by radiography, contrast studies and cross-sectional imaging
    ii. Vascular supply and drainage
    iii. Normal variants
b. Radiological technique in endocrine system
    i. Cross-sectional imaging techniques for the examination of the adrenal glands, thyroid, parathyroid, and pituitary gland
    ii. Interventional procedures and complications
c. Radiology and radionuclide imaging for endocrine system
    i. Technique and applications
d. Pathological correlation of altered radiological patterns in endocrine system
    i. Change in size, shape and texture
    ii. Calcification
    iii. Mass

3.1.13 Reproductive System and Breast

a. Anatomy of reproductive system and breast
    i. Anatomy of the male and female genital tracts, and breast, as demonstrated by radiography, mammography and cross-sectional imaging
    ii. Anatomy and the development of normal fetus
    iii. Vascular supply and drainage
    iv. Normal variants
b. Radiological technique in reproductive system and breast
    i. Cross-sectional imaging techniques of the female pelvis
    ii. Ultrasound techniques for examining the male and female genital tracts, including endocavity examination of pelvis and Doppler techniques
    iii. Ultrasound and contrast hysterosalpingography
    iv. Mammography, ultrasound and MRI of the breast
    v. Interventional procedures and complications
c. Radiology and radionuclide imaging for reproductive system and breast
    i. Technique and applications
d. Pathological correlation of altered radiological patterns in reproductive system and breast
    i. Change in size, shape, and texture
    ii. Calcification
    iii. Mass

Note: * Some aspect of applied physiology to be included in each system

3.2 PHASE II

3.2.1 Respiratory System

a. Differential diagnoses of lesion in the parenchyma, mediastinum, pleural and chest wall

i. The chest walls, pleural and diaphragm
- Pneumo/ hydro/ chylo/ pyo/ haemothorax
- Bronchopleural fistula
- Pleural thickening/ mass/ calcification
- Neoplasm
- Diaphragmatic eventration/ movement and paralysis/ hernias

ii. The mediastinum
- Thymic tumours and hyperplasia
- Teratoma and germ cell tumours
- Mediastinal lymphadenopathy
- Mediastinal lipomatosis
- Fibrosing mediastinitis
- Mediastinal emphysema
- Neurogenic tumours
- Aortic aneurysm
- Mesenchymal tumours
- Foregut cysts
- Extramedullary hematopoiesis
- Abdominal fat herniation

iii. Pulmonary infection in adults
- Bacterial pneumonia – associated features and complications
- Pulmonary tuberculosis
- Non-tuberculous mycobacterial and related infections
- Fungal infections
- Protozoal and metazoal diseases
- Viral pneumonia, HIV and AIDS
- Others - Interstitial pneumonia

iv. Airway disease
- Collapse – general features, lobar collapse, segmental collapse
- Bronchocoele
- Bronchiectasis
- Asthma
- Chronic bronchitis and emphysema
- Bronchiolitis
- Strictures and fistulae

v. Pulmonary neoplasm
- Primary
- Secondary
- Benign pulmonary lesions (includes vascular malformations)
- Solitary pulmonary nodule
- Lymphoma – NHL, Malignant lymphoma

vi. Diffuse pulmonary infiltrative disease
- Pulmonary oedema

- Pulmonary haemorrhage
- Diffuse pulmonary fibrosis
- Sarcoidosis
- Collagen vascular disease
- Systemic vasculitis
- Lymphoid disorders
- Pulmonary eosinophilia
- In immunocompromised host
- Drug induced lung disease

vii. Industrial lung disease
- Occupational asthma
- Extrinsic allergic alveolitis
- Pneumoconiosis including silicosis, asbestosis and coal worker
- Toxic fumes
- Zoonosis

viii. Pulmonary thromboembolism

ix. The postoperative lung transplantation and radiation

b. Common radiological features of the disease affecting the lung parenchyma, mediastinum, pleural and chest wall on various imaging modalities

3.2.2 Cardiovascular System

a. Differential diagnoses of lesion in heart, blood vessels
- Acquired valvular heart disease
- Ischemic heart disease
- Hypertensive heart disease
- Altered pulmonary circulation
- Cardiomyopathies
- Cardiac tumours
- Acquired pericardial disease
- Acquired aortic disease

b. Common radiological features of the disease affecting the heart, blood vessels and lymphatic drainage on various imaging modalities

3.2.3 Gastrointestinal System

a. Differential diagnoses of lesion in the gut and mesentery

i. The oesophagus
- Hiatal hernia
- Oesophagitis
- Achalasia
- Strictures & fistulae
- Neoplasm
- Varices
- Dermatological condition associated with oesophageal lesions
- Web
- Motility disorders
- Oesophageal diverticulosis
- Extrinsic oesophageal compression
- Postoperative changes

ii. The stomach
- Gastric ulcers and gastritis
- Neoplasm
- Diverticula, web, prolapsed gastric mucosa & varices
- Gastric volvulus
- Gastric outlet obstruction
- Gastroparesis diabeticorum
- Scleroderma
- The post-operative stomach

iii. The duodenum
- Peptic ulceration
- Gastric heterotopia
- Diverticula
- Neoplasm
- Pancreatitis
- Tuberculosis
- Radiation damage
- Progressive systemic sclerosis
- Intramural haematoma
- Compression & displacement
- Aorto-duodenal fistula
- Duodenal varices

iv. The small intestine
- Crohn's disease
- Coeliac disease
- Neoplasm
- Infection and infestations
- Radiation, ischemia and other enteritis
- Mechanical small bowel obstruction
- Ischaemia and infarction
- Intramural haemorrhage
- Diverticula and blind loop
- Neuromuscular disorder
- Nodular lymphoid hyperplasia and immunoglobulin deficiency
- Intestinal lymphagiectasia
- Waldenstrom's macroglobulinaemia
- Endometriosis

v. The large bowel
- Polyps & polyposis
- Neoplasm
- Diverticular disease
- Ischemic & other colitis
- Strictures & fistulae
- Lipomatous disorder
- Endometriosis
- The postoperative colon
- Appendiceal disease

vi. The mesentery and omentum
- Solid masses – Infection, neoplasm and miscellaneous solid mases
- Cystic masses – mesenteric/ omental cyst and neoplasm

vii. Acute abdomen
viii. AIDS manifestation

b. Common radiological features of the disease affecting the gut and mesentery on various imaging modalities

3.2.4 Hepatobiliary System

a. Differential diagnoses of lesion in the liver, gall bladder, biliary tract, spleen, and pancreas
   i. The liver
   - Neoplasm
   - Diffuse hepatic disease
   - Portal hypertension – extrahepatic, hepatic, post hepatic and surgery in portal hypertension
   - Liver transplantation and post-transplant complications

   ii. The biliary tract
   - Gall bladder – gall stones, cholecystitis, cholesterolosis, and cholecystosis
   - Neoplasm
   - Bile ducts – choledocholithiasis, tumours, strictures / fistulae, cholangitis, AIDS and parasites

   iii. The pancreas
   - Pancreatitis and its complications
   - Neoplasm

b. Common radiological features of the disease affecting the liver, gall bladder, biliary tract, spleen and pancreas on various imaging modalities

3.2.5 Reticuloendothelial System

a. Differential diagnoses of lesions affecting the lymphatic system and spleen
   - Lymphatic system disorders
   - Spleen diseases

b. Common radiological features of the diseases affecting the lymphatic system and the spleen on various imaging modalities

3.2.6 Genitourinary System

a. Differential diagnoses of lesion in the kidney, ureter, bladder, and urethra
   i. Renal parenchymal disease
   ii. Renal masses
   - Cyst
   - Inflammatory
   - Vascular
   - Angiomyolipoma
   - Focal hydronephrosis
   - Renal sinus lipomatosis
   - Benign
   - Malignant

   iii. Renal calculus
   iv. Renal failure and transplantations

v. Ureter
- Neoplasm
- Infection and inflammation
- Obstruction
- Strictures and fistulae

vi. Bladder
- Neoplasm
- Infection and inflammation
- Calculus and other obstruction
- Diverticulum and fistulae

vii. Urethra
- Neoplasm
- Infection and inflammation
- Calculus and other obstruction
- Strictures and fistulae
- Diverticulum

b. Radiological features of the disease affecting the kidney, ureter, bladder, and urethra on various imaging modalities

3.2.7 Central Nervous System

a. Differential diagnoses of lesion in the brain and spine
   i. Intracranial and spinal cord neoplasm
   ii. Intracranial and spinal cord infection and inflammation
   iii. Cerebrovascular and degenerative disease
   iv. Metabolic and nutritional disorder
   v. HIV infections and AIDS
   vi. CSF flow disturbance

b. Common radiological features of the disease affecting the brain and spine on various imaging modalities

3.2.8 ENT, Ophthalmology and Dental

a. Differential diagnoses of lesion in the ear, nose, throat, eye, and teeth
   i. Orbit
   - Infection and inflammation
   - Neoplasm
   - Vascular lesions
   - Endocrine manifestations
   - Miscellaneous

   ii. ENT
   - Neoplasm
   - Infections and inflammation
   - Vascular lesions
   - Miscellaneous

   iii. Dental
   - Caries
   - Neoplasm
   - Pulpitis and periapical infection
   - Periodontal disease

b. Common radiological features of the disease affecting the ear, nose, throat, eye, and dental on various imaging modalities

3.2.9 Musculoskeletal System

a. Differential diagnoses of lesion in the bones, muscles, and joints
    i. Bone and soft tissue neoplasm
    ii. Bone and soft tissue infection and inflammation
    iii. Myeloproliferative and similar disorders
        - Red and white cells disorders
        - Plasma cell disorders
        - Haemophilia and other bleeding disorders of coagulation
    iv. Metabolic, nutrition and endocrine disease of the bone and joint
    v. Degenerative spine and joint disease
    vi. Joint disease
        - Infection and Inflammatory
        - Neoplasm
        - Hypertrophic pulmonary osteoarthropathy
b. Common radiological features of the disease affecting the bones, muscles, and joints on various imaging modalites

3.2.10 Endocrine System

a. Differential diagnoses of lesion in the endocrine glands
    i. Pineal
    ii. Pituitary
    iii. Thyroid
    iv. Parathyroid
    v. Thymus
    vi. Pancreas
    vii. Carcinoid tumours
    viii. Adrenal
b. Common radiological features of the disease affecting endocrine glands on various imaging modalities

3.2.11 Trauma

a. Stage/ grade the trauma of all organs in the body system
    i. Head and neck
    ii. Spine
    iii. Chest
    iv. Abdomen and pelvis
    v. Genitals
    vi. Skeletal, joint and soft tissue
b. Common radiological features of trauma affecting all organs in the body systems.

3.2.12 Interventional Radiology

a. Principles and knowledge of various interventional procedures
    i. Neurovascular
    ii. Peripheral vascular
    iii. Interventional oncology
    iv. Pain management (e.g spine intervention, coeliac block)
    v. Image guided biopsy and drainage
b. Techniques of various interventional procedures and the management of possible complications
    i. Respiratory (e.g FNAC, biopsy, drainage)
    ii. Abdomen (e.g FNAC, biopsy, drainage, PTBD, nephrostomy)

iii. Musculoskeletal (e.g biopsy, drainage)
iv. Breast (e.g FNAC, biopsy including stereotactic, drainage, hookwire)
v. Venous access (e.g PICC, chemoport, IJC)

3.2.13 Paediatrics

a. Principles of paediatric imaging
b. Diagnoses and differential diagnoses of diseases in paediatrics
   i. Respiratory
   - Congenital respiratory anomalies
   - Meconium aspiration syndrome
   - Bronchopulmonary dysplasia
   - Respiratory distress syndrome
   - RSV bronchiolitis
   - Foreign body aspiration
   - Cystic fibrosis
   - Polycystic lung disease
   - Pulmonary sequestration
   - Pertussis
   - Epiglottitis
   - Tuberculosis
   - Viral/ bacterial pneumonia
   - Neoplasm: hamartoma; bronchogenic cyst
   - Congenital diaphragmatic hernia

   ii. Gastrointestinal tract
   - Congenital anomalies
   - Lesion causing obstruction: malrotation, volvulus, hypertrophic pyloric stenosis, intussusception, achalasia, atresia/ stenosis, Hirchsprung, mega/microcolon, duplication cyst.
   - Meconium plug, ileus/ peritonitis
   - Meckel diverticulum
   - Malabsorption including parasitic infestation
   - Hiatus hernia and reflux
   - Bleeding disorders in newborn
   - Abdominal wall abnormalities
   - Necrotising enterocolitis
   - Inguinal hernia

   iii. Cardiovascular
   - Congenital heart disease
   - Congenital anomalies of great vessels

   iv. Hepatobiliary system
   - Biliary atresia
   - Choledochal cysts
   - Caroli syndrome
   - Pre-duodenal portal vein
   - Rhabdomyosarcoma
   - Parasites infestations: ascariasis, hydatid disease, schistosomiasis
   - Infection and inflammation
   - Neoplasm

   v. Pancreas; congenital anomalies

vi. Musculoskeletal system
- Skeletal dysplasia and malformation syndrome
- Non-accidental injuries
- Developmental dysplasia of the hip
- Slipped femoral epiphyses
- Legg-Calves-Perthes disease
- Pediatric fractures

vii. Urinary system
- Pelvi-ureteric junction obstruction
- Multicystic kidney
- Vesico-ureteric reflux
- Posterior urethral valve
- Urinary tract infection
- Wilms tumour
- Mesoblastic nephroma
- Renal clear-cell carcinoma
- Neuroblastoma
- Rhabdomyosarcoma
- Adrenal haemorrhage

viii. Reproductive system
- Congenital anomalies of uterus and vagina
- Ovarian agenesis
- Testicular torsion
- Epididymitis

ix. Central nervous system
- Congenital lesions
- Hypoxic-ischaemic brain damage
- TORCHES
- Metabolic diseases
- Cephalohaematoma
- Phakomatoses
- Medulloblastoma
- Pilocystic astrocytoma
- Ependymoma

x. Ophthalmology, ENT and dental
- Congenital anomalies
- Cystic hygroma
- Congenital cholesteatoma
- Otosclerosis
- Orbital rhabdomyosarcoma, haemangioma, lymphangioma
- Coloboma
- Retinopathy of prematurity
- Retinoblastoma
- Coat disease
- Cleidocranial dysplasia
- Burkitt lymphoma

c. Radiological features of the diseases affecting the paediatrics on various imaging modalities

3.2.14 Reproductive System and Breast

a. Differential diagnoses of lesion in male and female reproductive organs, and breast
    i. Gynaecology
        - Neoplasm
        - Infection and inflammation
        - Infertility
        - Vascular diseases
    ii. Prostate, seminal vesicle and male external genitalia
        - Neoplasm
        - Infection and inflammation
        - Infertility
        - Vascular diseases
    iii. Differential diagnoses of lesions affecting the breasts
        - Neoplasm
        - Infection and inflammation
b. BI-RADS classification
c. Common radiological features of the disease affecting male and female reproductive organs, and breast on various imaging modalities

3.2.15 Intermediate Physics

i. Bone Densitometry
ii. MR diffusion & perfusion
iii. fMRI and DTI
iv. PET-CT, Cone beam CT
v. CT Perfusion

3.2.16 Advanced Physics

i. 3D/4D ultrasound
ii. Molecular Imaging
iii. MR spectroscopy
iv. US and MR elastography
v. MR guided high intensity focused ultrasound (HIFU)

3.2.17 Research Methodology, Biostatistics and Scientific Writing

i. Research methodology
ii. Biostatistics
iii. Scientific writing
iv. Conduct research project (dissertation)

3.2.18 Medical Ethics

i. Medical philosophy and treatment
ii. The comparison between western and eastern medical ethics
iii. Educational, physical and spiritual rehabilitation
iv. The concept and moral of a doctor in dealing with patient's problems
v. Dignity at all times

3.3 PHASE III

3.3.1 Problems encountered with newly appointed radiologist

i. Graduates have lack of/no knowledge in managerial tasks and legal issues
ii. Gross attitudinal problems: Lack of rapport/communication skill, not dynamic / proactive
iii. Lack of discipline
iv. Lack of leadership quality
v. Lacking /underperformance of caring, professionalism, and teamwork

3.3.2 Content in the New Syllabus Phase III

i. Management in Radiology
ii. Acts, Regulations, Code of Practice, Ethics and Issues
iii. Quality Assurance, control and maintenance program

3.3.3 Management in Radiology

a. Planning (current and forward)
b. Procurement
    i. Methods
    ii. Specification
    iii. Delivery and commissioning
    iv. Storage
c. Resources management
    i. Manpower (recruitment, training, CME and appraisal)
    ii. Financial (revenue and expenditure)
d. Research & development
e. Maintenance of equipment
f. Condemnation of equipment
g. Disposal of waste (e.g., clinical, domestic)
h. Image / film / documents
    i. Archive
    ii. Missing data (non-entry and loss)
i. Safety (OSHA)
    i. Ionizing radiation
    ii. Non-ionizing radiation
    iii. Diseases
    iv. Fire
j. Patient management
    i. Safety
    ii. Confidentiality
    iii. Privacy
    iv. Satisfaction (Patient and family)
k. Licensing
l. Incidence reporting (forms are available)

3.3.4 Acts, Regulations, Code of practice, Ethics and Issues

a. Acts: Act 304, National Archive Act
b. Code of Practice
c. Ethics and Issues

i. Breach of confidentiality and privacy
ii. Misconduct (Professionalism, teamwork corporate culture)
iii. Refusal of radiology requisition
iv. Reporting errors
v. Unreported examinations
vi. Imaging in pregnancy
vii. Communication and documentation lapse, lack of rapport

3.3.5 Quality Assurance Programme

i. Procedures
    i. Appointment
    ii. Waiting time
ii. Examination report
    i. Timely report
    ii. Communication of the report (e.g.: alert the clinician in ectopic, pneumothorax, leaking aneurysm cases)
iii. Audit (means of improvement)
    i. Patient (satisfaction, feedback)
    ii. Service (expansion, co-worker satisfaction, teamwork)
    iii. Examination's report (at least self-study)
    iv. Materials and equipment
    v. Financial
iv. ISO and Accreditation
v. Staff
    i. Key performance indicators
    ii. Feedback from the patients (Customer Satisfaction Survey)
vi. Quality control of image production
    i. Equipment
    ii. Film reject analysis (Digital)
    iii. PGMI for mammography (Perfect, Good, Moderate and Inadequate)

4. ASSESSMENT

4.1 PHASE I

Assessment will be focused on the concept of Basic Radiological Sciences, i.e. Basic Physics in Radiology, Radiology Anatomy, Radiographic and Radiological Techniques, Clinical Radiology (upper and lower limb trauma) and Drugs. The assessment will encompass the components of Continuous Assessment and the Professional I Examination.

4.1.1 CONTINUOUS ASSESSMENT

The student must get satisfactory result for all the components as pre-requisite to sit for the Professional Examination. The assessment comprises of

a. Mock Exam
   The student must sit for the mock exam that is conducted once per academic year (February/March). The result from this exam will be counted as part of eligibility criteria for the Professional Examination.
b. Logbook
   i. The satisfactory completion of the logbook is accepted as evidence of satisfactory completion of supervised clinical training as well as attendances in all scheduled teaching sessions
   ii. Satisfactory completion of compulsory clinical attachment and peripheral posting (HRPZ II)
c. Case report
   The students must submit one (1) case for publication 6 months before the Professional I Examination
d. Supervisor's report
   The Clinical Supervisor (s) will do this assessment at least once and submit it to the Department of Radiology. The student should score a minimum of 50% to be considered as satisfactory.

4.1.2 PROFESSIONAL I EXAMINATION

This examination will be conducted at the end of Phase I.

4.1.2.1 Examination Component

The examination is divided into four (4) components with total marks of 100%. The components are

1. MCQ - 100%
2. OSCE - 100%
3. OSPE - 100%
4. Viva-Voce - 100%

4.1.2.2 Marking Scheme and Grading System

Grade	Marks
A	70% and above
B	60 to 69%
C	50 to 59%
F	Below 50%

Those candidates who passed the repeat examination will be given a maximum of grade C.

4.1.2.3 Criteria for Passing Professional I Examination

The passing mark for each component is 50%.
The candidate must pass each of the components individually.

4.1.2.4 Repeat an Examination

Candidates have to repeat the component(s) that he/she had failed after 6 or 12 months. The candidates are allowed a maximum of three (3) attempts.

4.1.2.5 Criteria for Progression from Phase I to Phase II

i. Pass the Professional I Examination
ii. Approved by the Board of Examiners and School Board
iii. Confirmed by the Senate

4.2 PHASE II

Assessment in Phase II will be focused on the concept of clinical radiology, radiological diagnosis and patient's management. The assessment will encompass the components of the Continuous Assessment and Professional II Examination.

4.2.1 CONTINUOUS ASSESSMENT

The student must get satisfactory result for all the components as pre-requisite to sit for the Professional Examination. The assessment comprises of

a. Mock exam
   The student must sit for the mock exam that is conducted once per academic year (February/March). The result from this exam will be counted as part of eligibility criteria for the Professional Examination.
b. Logbook
   i. The satisfactory completion of the logbook is accepted as evidence of satisfactory completion of supervised clinical training as well as attendances in all scheduled teaching sessions
   ii. Satisfactory completion of compulsory clinical attachment for angiography, paediatrics or peripheral posting (HRPZ II)
c. Dissertation progress

The student must be at least at the stage of data collection (obtained approval from JEPeM).

d. Case report
    i. The students must submit another two (2) cases for publication during Phase II
    ii. At least one (1) case report should be sent for publication every 6 months
    iii. All submission for publication should be done at least six (6) months before the Professional II Examination
    iv. One (1) case report which has been submitted either during Phase I or Phase II must be accepted or published
    v. Student must present one (1) case report or dissertation at any conference prior to graduation
e. Supervisor's report
    The Clinical Supervisor (s) will do this assessment at least once and submit it to the Department of Radiology. The student should score a minimum of 50% to be considered as satisfactory.

4.2.2 PROFESSIONAL II EXAMINATION

This examination will be conducted at the end of Phase II.

4.2.2.1 Examination Component

There are 3 components of this examination:

i. Single Best Answer (2 papers x 100 questions) - 100%
ii. Film Reporting - 100%
iii. Viva-Voce - 100%

4.2.2.1 Marking Scheme and Grading System

Grade	Marks
A	70% and above
B	60 to 69%
C	50 to 59%
F	Below 50%

Those candidates who passed the repeat examination will be given a maximum of grade C.

4.2.2.2 Criteria for Passing Professional II Examination

The passing mark for SBA is 50% (subject to amendment by the university).
The passing mark for Film Reporting and Viva-Voce are 50%.
The candidate must pass each of the components individually.

4.2.2.3 Repeat an Examination

Candidates have to repeat the component(s) that he/she had failed after 6 or 12 months. The candidates are allowed a maximum of three (3) attempts.

4.2.2.4 Criteria for Progression from Phase II to Phase III

i. Pass the Professional II Examination
ii. Approved by the Board of Examiners and School Board
iii. Confirmed by the Senate

4.3 PHASE III

Candidate will be placed as a 'Consultant-in-Training' and will be expected to function independently in resource and patient management. The assessment will encompass the components of the Continuous Assessment and Final Evaluation of Phase III

4.3.1 CONTINUOUS ASSESSMENT

The student must get satisfactory result for all the components as pre-requisite to sit for the Professional Examination. The assessment comprises of

a. Mock exam
   The student must sit for the mock exam that is conducted once per academic year (February/ March). The result from this exam will be counted as part of eligibility criteria for the professional examination.
b. Logbook
   i. The satisfactory completion of the logbook is accepted as evidence of satisfactory completion of supervised clinical training as well as attendances in all scheduled teaching sessions
   ii. The student should get satisfactory report on plain radiograph reporting as required in the logbook
c. Dissertation progress
   The student must have submitted the final dissertation manuscript to the Postgraduate Office
d. Dissertation manuscript
   The students must prepare the dissertation in manuscript ready for submission to any suitable journal OR
   The students may also present the dissertation at any conference prior to graduation.
e. Supervisor's report
   The Clinical Supervisor (s) will do this assessment at least once and submit it to the Department of Radiology. The student should score a minimum of 50% to be considered as satisfactory.

4.3.2 FINAL EVALUATION OF PHASE III

4.3.2.1 Examination Component

This evaluation/examination consists of three components:

i. Dissertation report – examined by two (2) internal examiners who are appointed by the School Board.
ii. Viva-Voce on dissertation project.
iii. Rapid Film Reporting examination.

4.3.2.2 Criteria for Passing Phase III

i. Satisfactory Dissertation Report
ii. Satisfactory Viva-Voce
iii. Satisfactory Rapid Film Reporting

To obtain satisfactory result in the following components:

i. Dissertation Report – must obtain a minimum of level 2 by two examiners for final submission.
ii. Rapid Film Reporting – obtain marks of 50% and above

4.3.2.3 Repeat an Examination

Candidates have to repeat the component(s) that he/she had failed after 6 or 12 months. The candidates are allowed a maximum of three (3) attempts.

5. SUPERVISION AND ROLE OF SUPERVISOR

5.1 SUPERVISION

Supervision is the dynamic process in which the supervisor encourages and participates in the development and training of the candidate. Supervision is fundamental to the educational process.

The two (2) major objectives of supervision are:

1. To objectively evaluate candidate's performance using appropriate methods of assessment
2. Establishing a relationship that will help the candidate to self-actualize and become self-directed learners and highly motivated individuals

5.1.1 Course Supervisor

The course supervisor is the Head of Department of Radiology USM who is responsible for the smooth implementation of the M. Med (Radiology) Program. The head of department is also responsible for conducting regular meeting with the other supervisors to assess the progress of the candidates and to make appropriate recommendations for further improvement in training.

5.1.2 Course Coordinator

Course coordinators are elected by the course supervisor to coordinate all three phases.

5.1.3 Phase Coordinator

Phase coordinators are elected by the course supervisor to coordinate each phase of the course.

5.1.4 Candidate Supervisor

A candidate supervisor must be a specialist/consultant with at least 2 years' experience in his field. A candidate supervisor can supervise not more than 8 candidates at any one time.

5.1.5 Hospital-based Candidate Supervisor

The consultant radiologist in the hospital where candidate is posted (open system) is nominated by the Course Coordinator as a candidate supervisor. He/she will be appointed as Honorary Lecturer by the school's dean.

5.2 SUPERVISOR RESPONSIBILITIES

i. The supervisor should advise and assist the candidates regarding the case write-ups and dissertation.
ii. The supervisor should promptly mark and grade the write-ups and oral presentations. The mark should be recorded in the supervisors' report.
iii. The supervisor should assess and comment on the logbook entries
iv. The supervisor must submit a supervisor report to the Course Supervisor using the form provided
v. The supervisor should meet the candidate regularly to review the candidates' progress. Problems should be identified early to allow appropriate remedial measures to be taken.

6. SUGGESTED TEXTBOOKS, JOURNALS AND WEBSITES

6.1 TEXTBOOKS FOR PHASE I

6.1.1 Physics

i. Physics for Radiologists – by Dendy and Heaton Christensen's
ii. Introduction to the Physics of Diagnostic Radiology – Lea & Febeiger
iii. Farr's Physics for Medical Imaging – Penelope Allisy- Roberts

6.1.2 Radiological anatomy and radiographic positioning

i. An Atlas of Anatomy Basic to Radiology – by Meschan. WB Saunders
ii. Clark Positioning in Radiography – by Kathleen C Clark, Louis Kreel. W Heinemann
iii. Imaging Atlas of Human Anatomy – Jamie Weir
iv. Anatomy for Diagnostic Imaging - Stephanie Ryan
v. Applied Radiological Anatomy – Paul Butler

6.1.3 Radiological procedures and drugs

i. Diagnostic Radiography – by Glenda Bryan. Churchill Livingstone
ii. A Guide to Radiological Procedures – by S. Chapman and R. Nakielny. WB Saunders
iii. Techniques in Diagnostic Imaging – Graham H. Whitehouse

6.1.4 ICT and Applications in Radiology

6.2 TEXTBOOKS FOR PHASE II

i. Textbook of Radiology and Medical imaging – by David Sutton. Churchill Livingstone
ii. Diagnostic Radiology – by Grainger and Allison Churchill Livingstone
iii. X-Ray Diagnosis – by Armstrong and Wastie Blackwell
iv. Practical Nuclear Medicine- IRL Press
v. Aids to Radiological Differential Diagnosis – Chapman
vi. Radiology Review Manual – Wolfgang Dahnert

6.3 JOURNALS

i. Clinical Radiology
ii. British Journal of Radiology
iii. American Journal of Radiology
iv. Radiology
v. Seminars in Roentgenology
vi. Radiologic Clinics of North America
vii. Nuclear Medicine Communication

6.4 WEBSITES

www.radiologyeducation.com
www.mypacs.net
www.radquiz.com
www.pediatricradiology.com
www.auntminnie.com
www.acadmed.org.my
www.radiopedia.org
www.sprawls.org

7. ACADEMIC AND TEACHING STAFF

7.1 LECTURER

i. Prof. Dr. Mohd Shafie Abdullah (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med (Radiology)(USM)

ii. Assoc. Prof. Dr. Mohd Ezane Aziz (Medical Lecturer/Clinical Radiologist)
MD (UKM), M.Med (Radiology)(USM)

iii. Assoc. Prof. Dr. Juhara Haron (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med(Radiology)(USM)

iv. Dr. Khairil Amir Sayuti (Medical Lecturer/Clinical Radiologist)
MBBCh (Wales), M.Med (Radiology)(USM)

v. Dr. Chandran Nadarajan (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med (Radiology)(USM)

vi. Dr. Wan Aireene Wan Ahmed (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med (Radiology)(USM)

vii. Dr. Ahmad Hadif Zaidin Samsudin (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med (Radiology)(USM)

viii. Dr. Nur Hartini Mohd Taib (University Lecturer/Medical Physicist)
BSc (USM), MSc (USM), PhD (USM)

ix. Dr. Nur Asma Sapiai (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med (Radiology)(USM)

x. Dr. Nasibah Mohamad (Medical Lecturer/Clinical Radiologist)
MD (USM), M.Med (Radiology)(USM)

xi. Dr. Bazli Md Yusof (Medical Lecturer/Clinical Radiologist)
MB BcH BAO (Ireland), M.Med (Radiology) (USM)

xii. Dr. Fattah Rahiman Ghazali (Medical Lecturer/Clinical Radiologist)
MBBS (UM), M.Med (Radiology) (USM)

xiii. Dr. Ahmad Aizuddin Mohamad Jamali (Medical Lecturer/Clinical Radiologist)
MBBS (Manipal), M.Med (Radiology) (USM)

xiv. Dr. Lau Chiew Chea (Medical Lecturer/Clinical Radiologist)
MBBS (AIMST), M.Med (Radiology) (USM)

xv. Dr. Mohd Hafizuddin Husin (Medical Lecturer/Clinical Radiologist)
MD (VolSMU, Rusia), M.Med (Radiology) (USM)

xvi. Dr. Shafora Bibi Samri (Medical Lecturer/Clinical Radiologist)
MBBCh (Alexandria), M.Med (Radiology) (USM)

xvii. Dr. Zul Khairul Azwadi Ismail (Medical Lecturer/Clinical Radiologist)
BMedSc (Melbourne), MD (UI), M.Med (Radiology) (USM)

7.2 ADJUNCT LECTURER

Advanced Medical and Dental Institute, USM

i. Dr. Muhamad Zabidi Ahmad (Medical Lecturer/Clinical Radiologist)
MD (UKM), M.Med (Radiology) (USM)

ii. Dr. Noor Khairiah A. Karim (Medical Lecturer/Clinical Radiologist)
MBBS (UM), M.Rad (UM)

iii. Assoc. Prof. Dr. Rafidah Zainon (University Lecturer/ Medical Physicist)
B. App Sc (Hons) (USM), MSc (USM), PhD (New Zealand)

iv. Dr. Noor Diyana Osman (University Lecturer/ Medical Physicist)
B. App Sc (Hons) (USM), MSc (USM), PhD (UiTM)

Department of Nuclear Medicine, Radiotherapy and Oncology, USM

i. Dr. Ahmad Lutfi Yusoff (University Lecturer/Medical Physicist)
BSc (USA), MSc (USM), PhD (UK)

7.3 HONORARY LECTURER

i. School of Medical Sciences, Universiti Sains Malaysia
Prof. Dr. Ibrahim Lutfi Shuaib
MBBS (UM), DMRD (Liverpool), FRCR (UK)

ii. Hospital Raja Perempuan Zainab II, Kota Bharu
Dr. Zaihan Awang (Clinical Radiologist)
MD (UKM), M.Med (Radiology)(USM)

iii. Hospital Pulau Pinang
Dr. Nurul Akhmar binti Omar (Clinical Radiologist)
MBBS (UM), M.Med (Radiology)(USM)

iv. Hospital Raja Permaisuri Bainun, Ipoh
Dr. Rozita Mohd Ghazali (Clinical Radiologist)
MBBS (Adelaide), M.Med (Radiology)(USM)

v. Hospital Sultanah Bahiyah, Alor Setar
Dr. Nik Fatimah Salwati Nik Malek (Clinical Radiologist)
MBBS (UM), M.Med (Radiology)(UKM)

vi. Hospital Seberang Jaya, Pulau Pinang
Dr. Roslina Abdul Halim (Clinical Radiologist)
MD (UKM), M.Med (Radiology)(USM)

vii. Hospital Sultan Abdul Halim, Sungai Petani
Dr. Fajariah Beevi Abdul Rahim (Clinical Radiologist)
MD (USM), M.Med (Radiology)(UKM)

viii. Hospital Tuanku Fauziah, Kangar
Dr Asmah Omar (Clinical Radiologist)
MD (USM), M.Rad (UM)

8. RULES, REGULATION AND POLICIES

8.1 LEAVES

8.1.1 ANNUAL LEAVES

i. The students are eligible for a total of 28 days of annual leave per one academic year.
ii. The leaves are given for 7 days in every 3 months and should be taken within the stipulated duration. No carry forward is allowed without permission from the Head of Department.
iii. The leaves should be taken in less than 12 consecutive days (including weekend and public holiday).

8.1.2 SICK LEAVES

i. The students are eligible for 7 days of sick leave per academic semester (excluding weekend and public holiday) OR maternity leave (see below).
ii. Quarantine leave is considered as sick leave.
iii. No carry forward is allowed for sick leave.

8.1.3 MATERNITY LEAVES

i. 14 days of unrecorded leave (14 consecutive days including weekend and public holiday) will be granted for maternity leaves.
ii. The students may add 7 days of her annual leaves.
iii. The students who taken maternity leave are not eligible for sick leave.

8.1.4 STUDY LEAVES

i. The students who sit for the Professional Examination are eligible for a total of 14 days of study leave.
ii. The leaves are given in 2 separate sessions; 1 week in staggered and 1 week continuously (just before the written exam – MCQ for Phase I and SBA/ FR for Phase II).

8.1.4 SPECIAL LEAVES

Any other leaves stated above should be discussed with the academic supervisor and Head of Department.

8.2 ABSENTEE

If the students are absent from academic activities for 28 days or more in a year or 14 days or more within 6 months, he/she shall be extended for 6 months. Days of absence will be deducted from annual leave.

9. APPENDICES

9.1 APPENDIX A: EVALUATION TOOLS

There are values which candidates must develop and possess right from the start of the program. The candidates must develop a sense of belonging to the unit they are attached to, be committed as an integral part of the service team and function as an effective apprentice to the supervisor. The service given is essential as an integral part of learning. Apart from learning how to care for the patients, they must also develop professional qualities, managerial and leadership skills as well as demonstrate the ability to be self-directed learners who are motivated to continually improve their performance.

Thus, the assessment of practice is a very important component of the progress evaluation. The tools used in the assessment emphasize the link to practice. Candidates are encouraged to meet and discuss their performance regularly with their supervisors to obtain early feedback and subsequently take an initiative to search for the relevant information to improve them.

The tools used are aimed at assessing different competencies.

9.1.1 PHASE I

a. Continuous Assessment

Continuous assessment consists of supervisors' report, mock examination, case report and logbooks. The supervisor will assess the students on their academic performance, professional skill, interpersonal skill, personality, attitude, and technical skill. In the logbook, students must record all the procedures that he/she gets involved with level of participation and all academic activities such as presentation in seminar, journal club, MDT and CPC. (Refer 4.1.1)

b. Professional I Examination

i. Multiple Choice Questions

It comprises of 60 questions of physics, radiology anatomy, techniques and trauma (2 hours). Marks will be deducted for the wrong answers.

ii. OSCE/ OSPE

a) The OSCE consists of various stations of physics, radiological anatomy and techniques in which the questions are based on practical and clinical knowledge.

b) The OSPE station consists of practical radiological questions. Each station is given 15 minutes.

iii. Viva–Voce

Two pairs of examiners examine each candidate. One pair consists of one radiologist and one medical physicist, and another pair consists of two radiologists. Each pair of examiners will assess the students for a period of 30 minutes.

9.1.2 PHASE II

a. Continuous Assessment

Students must pass the continuous assessment, as it is a prerequisite to sit for the final examination. (Refer 4.2.1)

b. Professional II Examination

i. Multiple Choice Questions

Single best answer (2 papers). Each paper comprises of 100 questions regarding clinical radiology (2 hours and 30 minutes per paper).

ii. Film Reporting (FR)

Candidates are given 8 cases for a period of 80 minutes. Each case may consist of more than one imaging modality.

iii. Viva-Voce

There will be two pairs of examiners. Each pair will examine the candidate for a period of 30 minutes.

9.1.3 PHASE III

a. Continuous Assessment

Students must pass the continuous assessment, as it is a prerequisite to sit for the final examination. (Refer 4.3.1)

b. Final Evaluation of Phase III (Refer 4.3.2)

i. Rapid Film Reporting examination

Each candidate is given 25 radiological cases. The time given is 30 minutes. Each case contributes 4 marks. The first 4 wrong answers contribute to minus 8 (-8) marks; the subsequent wrong answer is zero (0) mark.

9.2 APPENDIX B: GUIDELINE FOR CASE REPORT AND DISSERTATION MANUSCRIPT FOR PUBLICATION

9.2.1 TYPE OF PUBLICATION

The students are required to submit for publications: -

a. Case Report: Total of three (3) cases. One (1) in Phase I and two (2) in Phase II.
b. Dissertation Manuscript: At least 1 manuscript during Phase III.

9.2.2 SELECTION OF CASES

a. Case Report
   Any case that is suitable to be published in local, regional or international journal such as unusual manifestation of a common problem, a rare case or problem arise in management of cases. For selection of cases the students should discuss the case with his/her supervisor. Cases from the Selayang Hospital, IKN, HRPZ II or PJJ centers should be consulted with the attending radiologists.

b. Manuscript from dissertation
   The student should follow the guideline for preparation of dissertation proposal and manuscript writing.

9.2.3 FORMAT

The case report and dissertation manuscript are prepared according to the format of the selected journal. The supervisor should be assigned as correspondent author and the student as first author. The reporting radiologist should be assigned as co-author.

9.2.4 SELECTION OF JOURNAL

The case report and dissertation manuscript are encouraged to be submitted to the indexed journal, namely MyCite, Scopus or Web of Science.

9.2.5 SUBMISSION

a. Case Report
   i. At least one (1) article should be sent for publication in Phase I and two (2) in Phase II. All submission for publication should be done at least six (6) months before the Professional Examinations.
   ii. A copy of proof of submission to the journal (received via email) should be sent to the Radiology office for housekeeping together with the **Case Report Submission Form.**

b. Dissertation Manuscript
   The manuscript should be submitted to Postgraduate Office by **February for the May exam candidates** and by **August for the November exam candidates**.

9.2.6 PRESENTATION

At least one (1) case report (additional to the 3 case reports stated in section 9.2.1a) or the dissertation manuscript **MUST** be presented at any conference either as oral or poster presentation prior to graduation.

9.2.7 REWARDS & PENALTY

Publication will be taken as criteria for best student award.

The student can be barred from Phase I, Phase II or Phase III Professional Examination for failure to submit the case reports and dissertation manuscript for publication.

9.3 APPENDIX C: GUIDELINES FOR DISSERTATION

Candidates are required to carry out the research project during Phase II and Phase III

9.3.1 SELECTION OF TOPIC

Candidates must discuss with the supervisor within a period of two months after passing the Phase 1 examination to identify a suitable dissertation topic. By third month, candidates are expected to present the research proposal at departmental meeting.

9.3.2 ETHICAL APPROVAL

All research proposals must be submitted to the Ethical Committee for ethical clearance.

9.3.3 REGISTRATION OF RESEARCH PROJECT

The approved research topic must be registered to department's office and photocopy of ethical approval must be submitted together with final research proposal before he/she can start doing works. Candidates must fill in the Dissertation Progress Monitoring Form and Dissertation Oath.

Notes:
The approval to carry out research work in the Department of Radiology is not required for Master of Medicine (Radiology) candidates but permission to collect data from Hospital Director is required. Kindly refer to the hospital SOP.

9.3.5 WRITING OF DISSERTATION REPORT

The guideline for preparation of dissertation using manuscript format is as below

Table of content
Acknowledgements
Abstrak (BM)
Abstract (BI)
Introduction
a. Literature review (not detail)
    - Effectively using current medical evidence
b. Rational of the study
    - To identify gaps of the available knowledge
    - Rationalise the study objectives and methodology

Study protocol
a. Document submitted for ethical approval
b. Ethical approval letter
c. Amendment from approved of study protocol and its justification
    - Need to provide proof of communication with Ethical Committee

Body (manuscript ready for submission)
a. Contents
    i. Title page – no need to submit
    ii. Abstract
    iii. Introduction
    iv. Methodology
    v. Results

vi. Discussion
vii. References
viii. Table and figures

b. Number of words: 3000-5000

Appendices (where appropriate)

- Elaboration of the methodology
- Elaboration of the laboratory component
- Raw data in SPSS/other software in CD
- Additional tables/graphs
- Additional information
- Selected journal format (recommended MJMS)
- Evidence of submission/ accepted for publication (optional)

9.3.6 SUBMISSION OF DISSERTATION FOR EXAMINATION

The final draft of dissertation report must be submitted to postgraduate office before or on the date determined by Deputy Dean of Postgraduate and Professional Training.

Notes:
For further details, please refer to Guide to the Preparation of Dissertation for Master of Medicine Program prepared by Postgraduate Section, School of Medical Sciences, USM

9.4 APPENDIX D: LEARNING SCHEDULE FOR PHASE I (INTENSIVE COURSE)

9.4.1 COURSE TIMETABLE

Below is the example of tentative content for a yearly academic calendar. It is subject to changes.

a. Event calendar

Important Dates	Events
2022	
December (1st week)	Orientation
2023	
First Week of March	Submission of Logbook (Dec – Feb) & Meeting Supervisor
March	Intensive Course I
March	Continuous Assessment
First Week of June	Submission of Logbook (Mar – May) & Meeting Supervisor
First Week of July	Submission of Case Report to Journal for Publication
July	Intensive Course II
First Week of September	Submission of Logbook (Jun – Aug) & Meeting Supervisor
First Week of October	Submission of Logbook (Sep – Oct) & Meeting Supervisor
November	**Professional I Examination**

b. Intensive Course

INTENSIVE COURSE I MARCH				
DATE	TIME	TOPICS	LECTURER	STUDENTS
Day 1 Sunday	8.30-10.00	Radiology Hot Seat (1)	Radiologist	
	10.00-11.00	Self-study		
	11.00-12.30	Radiology Hot Seat (2)	Radiologist	
	2.30-4.00	Physics-Tutorial (1)	Physicist	
	4.00-5.30	Radiology Hot Seat (3)	Radiologist	
Day 2 Monday	8.30-9.30	Radiology Hotseat (4)	Radiologist	
	10.00-11.30	Self-study		
	12.00-1.00	Radiology Hotseat (5)	Radiologist	
	2.30-4.00	Physics Tutorial (2)	Physicist	
	4.00-5.30	Radiology Hotseat (6)	Radiologist	
Day 3 Tuesday	8.30-10.00	Physics Tutorial (3)	Physicist	
	10.00-11.00	Self-study		
	11.00-12.30	Radiology Hotseat (7)	Radiologist	
	2.30-4.00	Physics Tutorial (4)	Physicist	
	4.00-5.00	Self-study		
Day 4 Wednesday	**CONTINUOUS ASSESSMENT (MOCK EXAM)**			
Day 5 Thursday	**CONTINUOUS ASSESSMENT (MOCK EXAM)**			

INTENSIVE COURSE II JULY				
Day 1 Sunday	8.30-10.00am	Radiology Hotseat (8)	Radiologist	
	10.00-11.00am	Self-study		
	11.00-12.30pm	Radiology Hotseat (9)	Radiologist	
	2.30-4.00pm	Physics Tutorial (5)	Physicist	
	4.00-5.30pm	Radiology Hotseat (10)	Radiologist	
Day 2 Monday	8.30-10.00am	Radiology Hotseat (11)	Radiologist	
	10.00-11.00am	Self-study		
	11.00-12.30pm	Radiology Hotseat (12)	Radiologist	
	2.30-4.00pm	Physics Tutorial (6)	Physicist	
	4.00-5.30pm	Radiology Hotseat (13)	Radiologist	
Day 3 Tuesday	8.30-10.00am	Radiology Hotseat (14)	Radiologist	
	10.00-11.00am	Self-study		
	11.00-12.30pm	Physics Tutorial (7)	Physicist	
	2.30-4.00pm	Physics Tutorial (8)	Physicist	
	4.00-5.30pm	Radiology Hotseat (15)	Radiologist	
Day 4 Wednesday	8.30-10.00am	Physics Tutorial (9)	Physicist	
	10.00-11.30am	Introduction to Statistics	Statistician	
	12.00-1.00pm	Self-study		
	2.00-3.30pm	As in academic programme		
	3.30-5.00pm	As in academic programme		
Day 5 Thursday	8.30-10.00am	Radiology Hotseat (16)	Radiologist	
	10.00-11.00am	Self-study		
	11.00-12.30pm	Physics Tutorial (10)	Physicist	
	2.30-4.00pm	Physics Tutorial (11)	Physicist	
	4.00-5.30pm	Radiology Hotseat (17)	Radiologist	

c. Weekly academic classes

Date	Week	Time	Topics	Lecturer	Candidate
Dec	1	2.00-3.30	1. Fundamentals of Atomic Physics and Radioactivity	Physicist	
		3.30-5.00	*[1] Respiratory System 1*	Radiologist	Student
Dec	2	2.00-3.30	2. Production of X-ray	Physicist	
		3.30-5.00	*[2] Respiratory System 2*	Radiologist	Student
Dec	3	2.00-3.30	3. Important Aspects of Plain Radiography	Physicist	
		3.30-4.30	4. Image Receptor 1	Physicist	
		4.30-5.30	5. Image Receptor 2	Physicist	
Dec	4	2.00-3.30	6. Interaction of X-ray & Gamma Ray with Matter and Their Effects on Irradiated Materials 1	Physicist	
		3.30-5.00	*[3] Respiratory System – Pathological Correlation*	Radiologist	Student
Jan	5	2.00-3.30	7. Interaction of X-ray & Gamma Ray with Matter and Their Effects on Irradiated Materials 2	Physicist	
		3.30-5.00	*[4] Respiratory System - Hotseat*	Radiologist	
Jan	6	2.00-3.30	8. Radiation Protection 1	Physicist	

		3.30-5.00	*[5] CVS & Lymphatic System 1*	Radiologist	Student
Jan	7	2.00-3.30	9. Radiation Protection 2	Physicist	
		3.30-5.00	*[6] CVS & Lymphatic System 2*	Radiologist	Student
Jan	8	2.00-3.30	PHYSIC TUTORIAL 1	Physicist	
		3.30-5.00	*[7] CVS & Lymphatic System – Pathological Correlation*	Radiologist	Student
Feb	9	2.00-3.30	Practical Radiography – Chest	Radiographer	
		3.30-5.00	*[8] Cardiac Technique*	Radiologist	Student
Feb	10	2.00-3.30	*[9] CVS & Lymphatic System - Hotseat*	Radiologist	
		3.30-5.00	*[10] MSK 1*	Radiologist	Student
Feb	11	2.00-3.30	10. Digital Imaging – Fluoroscopy & DSA 1	Physicist	
		3.30-5.00	11. Digital Imaging – Fluoroscopy & DSA 2	Physicist	
Feb	12	2.00-3.30	*[11] MSK 2*	Radiologist	Student
		3.30-5.00	*[12] MSK – Trauma & Pathological Correlation*	Radiologist	Student
Mar	13	2.00-3.30	12. Radionuclide Imaging 1	Physicist	
		3.30-5.00	13. Radionuclide Imaging 2	Physicist	
Mar	14	2.00-3.30	14. Radionuclide Imaging 3	Physicist	
		3.30-5.00	15. Measurement of X-ray and Gamma-ray	Physicist	
Mar	15	2.00-3.30	*[13] MSK – Ultrasound & Arthrography*	Radiologist	Student
		3.30-5.00	Practical Radiography – Upper & Lower Limbs	Radiographer	
MARCH			**INTENSIVE COURSE I**		
MARCH			**CONTINUOUS ASSESSMENT (MOCK EXAM)**		
Mar	16	2.00-3.30	16. Radiological Image Quality 1	Physicist	
		3.30-5.00	*[14] MSK – Hotseat*	Radiologist	
Apr	17	2.00-3.30	17. Radiological Image Quality 2	Physicist	
		3.30-5.00	*[15] Endocrine System*	Radiologist	Student
Apr	18	2.00-3.30	18. Computed Tomography 1	Physicist	
		3.30-5.00	19. Computed Tomography 2	Physicist	
Apr	19	2.00-3.30	20. Computed Tomography 3	Physicist	
		3.30-5.00	*[16] Endocrine System – Pathological Correlation & Hotseat*	Radiologist	Student
Apr	20	2.00-3.30	PHYSICS TUTORIAL 2	Physicist	
		3.30-5.00	*[17] ENT & Teeth*	Radiologist	Student
May	21	2.00-3.30	PHYSICS TUTORIAL 3	Physicist	
		3.30-5.00	*[18] ENT & Teeth – Pathological Correlation & Hotseat*	Radiologist	Student
May	22	2.00-3.30	(1) Basic – PACS/ RIS/ DICOM/ Networking/ Teleradiology	Physicist	
		3.30-5.00	*[19] Ophthalmology*	Radiologist	Student
May	23	2.00-3.30	(2) Application – PACS/ RIS/ DICOM/ Networking/ Teleradiology	Physicist	
		3.30-5.00	*[20] Ophthalmology – Pathological Correlation & Hotseat*	Radiologist	Student

May	24	2.00-3.00	Practical Radiography – Face/ Skull/ PNS	Radiographer	
		3.30-5.00	*[21] Breast*	Radiologist	Student
May	25	2.00-3.30	*[22] Breast – Pathological Correlation & Hotseat*	Radiologist	Student
		3.30-5.00	PHYSICS TUTORIAL 4	Physicist	
Jun	26	2.00-3.30	21. Mammography	Physicist	
		3.30-5.00	(3) QA/ QC Mammography	Radiographer	
Jun	27	2.00-3.30	Mammography Positioning	Radiographer	
		3.30-5.00	*[23] Contrast Media & Drugs in Radiology 1*	Radiologist	Student
Jun	28	2.00-3.30	22. Ultrasound 1	Physicist	
		3.30-5.00	*[24] Contrast Media & Drugs in Radiology 2*	Radiologist	Student
Jun	29	2.00-3.30	23. Ultrasound 2	Physicist	
		3.30-5.00	*[25] GIT 1*	Radiologist	Student
Jul	30	2.00-3.30	24. Ultrasound 3	Physicist	
		3.30-5.00	*[26] GIT 2*	Radiologist	Student
Jul	31	2.00-3.30	(4) Quality Assurance/ Quality Control 1	Physicist	
		3.30-5.00	*[27] GIT – Pathological Correlation*	Radiologist	Student
Jul	32	2.00-3.30	(5) Quality Assurance/ Quality Control 2	Physicist	
		3.30-5.00	*[28] GIT – Hotseat*	Radiologist	
JULY			**INTENSIVE COURSE II**		
Jul	33	2.00-3.30	25. Magnetic Resonance Imaging 1	Physicist	
		3.30-5.00	26. Magnetic Resonance Imaging 2	Physicist	
Aug	34	2.00-3.30	(6) Film Fault & Reject Analysis	Physicist	
		3.30-5.00	27. Magnetic Resonance Imaging 3	Physicist	
Aug	35	2.00-3.30	PHYSICS TUTORIAL 5	Physicist	
		3.30-5.00	Practical Radiography – Abdomen/ KUB	Radiographer	
Aug	36	2.00-3.30	*[29] HBS*	Radiologist	Student
		3.30-5.00	*[30] HBS – Pathological Correlation & Hotseat*	Radiologist	Student
Aug	37	2.00-3.30	*[31] Genitourinary System*	Radiologist	Student
		3.30-5.00	*[32] Genitourinary System – Pathological Correlation & Hotseat*	Radiologist	Student
Aug	38	2.00-3.30	*[33] CNS 1*	Radiologist	Student
		3.30-5.00	*[34] CNS 2*	Radiologist	Student
Sept	39	2.00-3.30	*[35] CNS – Pathological Correlation*	Radiologist	Student
		3.30-5.00	*[36] CNS – Hotseat*	Radiologist	
Sept	40	2.00-3.30	*[37] Spine 1*	Radiologist	Student
		3.30-5.00	*[38] Spine 2*	Radiologist	Student
Sept	41	2.00-3.30	*[39] Spine – Pathological Correlation*	Radiologist	Student
		3.30-5.00	*[40] Spine – Hotseat*	Radiologist	
Sept	42	2.00-3.30	Practical Radiography – Spine	Radiographer	
		3.30-5.00	PHYSICS TUTORIAL 6	Physicist	
Oct	43	2.00-3.30	*[41] Reproductive System*	Radiologist	Student
		3.30-5.00	*[42] Reproductive System – Pathological Correlation & Hotseat*	Radiologist	Student

Oct	44	2.00-3.30	*[43] Interventional Radiology*	Radiologist	Student
		3.30-5.00	*[44] Interventional Radiology - Hotseat*	Radiologist	
NOV 2023 PROFESSIONAL 1 EXAM					

Note- The students need to confirm with the lecturers for the classes in advance (at least a week earlier)

List of Lecturers and Tutors

Radiologist	**Physicist**
1. P.M. Dr. Mohd Ezane Aziz (MEA) 2. P.M. Dr. Juhara Haron (JH) 3. Dr. Khairil Amir Sayuti (KAS) 4. Dr. Ahmad Hadif Zaidin Samsudin (AHZS) 5. Dr. Nur Asma Sapiai (NAS) 6. Dr. Bazli Md Yusoff (BMY) 7. Dr. Fattah Rahiman Ghazali (FRG) 8. Dr. Lau Chiew Chea (LCC) 9. Dr. Ahmad Aizuddin Mohamad Jamali (AAMJ) 10. Dr. Mohd Hafizuddin Husin (MHH) 11. Dr. Shafora Bibi Samri (SBS) 12. Dr. Zul Khairul Azwadi Ismail (ZKAI)	1. Dr. Ahmad Lutfi Yusof (ALY) 2. Dr. Nur Hartini Mohd Taib (NH) 3. P.M. Dr. Rafidah Zainon (RZ) 4. Dr. Noor Diyana Osman (NDO) 5. Pn. Siti Aishah Abdul Aziz (SAA) 6. Cik Tasnim Mockter (TM)
Radiographer	**Statistician**
1. En. Nik Fauriza Nik Lah (NF) 2. Pn. Norida Ahmad (NA) 3. Pn. Wan Shashila Eliana Wan Shafie (WSE) 4. Pn. Wan Nazyrah Abdul Halim (WN) 5. En. Abdul All Hanif Mamat (AAH) 6. Pn. Nur Azuani Mohamed Adenan (NAMA) 7. En. Mohamad Hisyam Zulkifli (MHZ)	1. P.M. Dr. Najib Majdi Yaacob (NMY)

9.4.2 GUIDELINES FOR PRESENTATION (WEEKLY ACADEMIC CLASSES)

Structural approach in each system is as follows

a. Section 1
    i. Radiological anatomy (gross and functional whenever applicable)
    ii. Embryology as a guide/outline to understand congenital anomalies, variants and some developmental problems

b. Section 2
    Radiographic images
    i. Plain radiographic anatomy – various views
    ii. Radiographic critique
    iii. Measurement: line and angles to assess; i.e. dislocation, scoliosis, cervico-vertebral junction, etc.
    iv. Normal variant
    v. Functional correlation

c. Section 3
    i. Cross sectional images – CT, MR, US
    ii. Angiographic images – (whenever applicable)

These approaches are applicable to the following systems: (1) CNS, (2) Abdomen, (3) Chest, (4) Urinary system, (5) Musculoskeletal system and (6) Spine. Small parts presentations should be adjusted according to the time frame.

9.5 APPENDIX E: LEARNING SCHEDULE FOR PHASE II (BLOCK ROTATION)

9.5.1 BLOCK ROTATION TIMETABLE

Below is the guideline distribution of system for the block rotation and is subject to changes.

Week	Date (Starting)	Block	Lecturer
1	**June**	Respiratory System	WAWA
2		Respiratory System	WAWA
3		Genitourinary System	MHH
4		Genitourinary System	AAMJ
5		Women's Health: Reproductive System and Breast	JH
6		Women's Health: Reproductive System and Breast	LCC
7		Musculoskeletal System	MEA
8		Musculoskeletal System	FRG
9		Gastrointestinal System	ZKAI
10		Gastrointestinal System	JH
11		Trauma	KAS
12		Trauma	MHH
13		***Bengkel GCP**	**-**
14		Endocrine System	SBS
15		Endocrine System	SBS
16		Central Nervous System	BMY
17		Central Nervous System	BMY
18		Paediatrics	AHZS
19		Paediatrics	AHZS
20		Interventional Radiology	MSA
21		Interventional Radiology	CN
22	**November**	**Professional Exams**	**-**
23		**Professional Exams**	**-**
24		**Professional Exams**	**-**
25		**Professional Exams**	**-**
26		Cardiovascular and Lymphatic System	KAS
27		Cardiovascular and Lymphatic System	AAMJ
28		ENT, Ophthalmology and Teeth	NM
29		ENT, Ophthalmology and Teeth	NM
30		Hepatobiliary System	MSA
31		Hepatobiliary System	CN
32		Intermediate Physics	NH
33	**January**	**Continuous Assessment Test**	**-**
34		Respiratory System	WAWA
35		Respiratory System	WAWA
36		Genitourinary System	LCC
37		Genitourinary System	AAMJ
38		Women's health: Reproductive System and Breast	JH
39		Women's health: Reproductive System and Breast	LCC
40		**Kursus Bio Etika dan Keterampilan Komunikasi**	-
41		**Intermediate Biostatistics, Scientific Writing & Producing A Quality Thesis**	-
42		Musculoskeletal System	MEA
43		Musculoskeletal System	FRG
44		Gastrointestinal System	ZKAI
45		Gastrointestinal System	ZKAI

Week	Date (Starting)	Block	Lecturer
46		Trauma	AHZS
47		Trauma	FRG
48	**May**	**Professional Exams**	**-**
49		**Professional Exams**	**-**
50		**Professional Exams**	**-**
51		**Professional Exams**	**-**
52		**Professional Exams**	**-**
53	**June**	Endocrine System	SBS
54		Endocrine System	SBS
55		Central Nervous System	BMY
56		Central Nervous System	BMY
57		Paediatrics	AHZS
58		Paediatrics	AHZS
59		Interventional Radiology	MSA
60		Interventional Radiology	CN
61		Cardiovascular and Lymphatic system	KAS
62		Cardiovascular and Lymphatic system	AAMJ
63		ENT, Ophthalmology and Teeth	NM
64		ENT, Ophthalmology and Teeth	NM
65		***Bengkel GCP**	**-**
66		Hepatobiliary System	MSA
67		Hepatobiliary System	CN
68		Intermediate Physics	NH
69		Respiratory System	WAWA
70		Respiratory System	WAWA
71		Genitourinary System	LCC
72		Genitourinary System	AAMJ
73		Women's health: Reproductive System and Breast	JH
74		Women's health: Reproductive System and Breast	LCC
75	**November**	**Professional Exams**	**-**
76		**Professional Exams**	**-**
77		**Professional Exams**	**-**
78		**Professional Exams**	**-**
79		Musculoskeletal System	MEA
80		Musculoskeletal System	FRG
81		Gastrointestinal System	ZKAI
82		Gastrointestinal System	ZKAI
83		Trauma	AHZS
84		Trauma	FRG
85	**January**	**Continuous Assessment Test**	**-**
86		Endocrine System	SBS
87		Endocrine System	SBS
88		Central Nervous System	BMY
89		Central Nervous System	BMY
90		Paediatrics	AHZS
91		Paediatrics	AHZS
92		Interventional Radiology	MSA
93		Interventional Radiology	CN
94		Cardiovascular and Lymphatic system	KAS
95		Cardiovascular and Lymphatic system	AAMJ
96		ENT, Ophthalmology and Teeth	NM
97		ENT, Ophthalmology and Teeth	NM

Week	Date (Starting)	Block	Lecturer
98		Hepatobiliary System	MSA
99		Hepatobiliary System	CN
100		Intermediate Physics	NH
101	**May**	**Professional Exam**	**-**
102		**Professional Exam**	**-**
103		**Professional Exam**	**-**
104		**Professional Exam**	**-**

*The dates of the courses are provisional. Confirmation will be issued by the PPSP.

**If the scheduled class falls on public holidays, the session needs to be arranged with the respective lecturer in charge.

***List of the lecturers involved in the teaching:

Radiologist	**Physicist**
1. Prof. Dr. Mohd Shafie Abdullah (MSA) 2. P.M. Dr. Mohd Ezane Aziz (MEA) 3. P.M. Dr. Juhara Haron (JH) 4. Dr. Khairil Amir Sayuti (KAS) 5. Dr. Ahmad Hadif Zaidin Samsudin (AHZS) 6. Dr. Wan Aireene Wan Ahmed (WAWA) 7. Dr. Nur Asma Sapiai (NAS) 8. Dr. Nasibah Mohamad (NM) 9. Dr. Bazli Md Yusoff (BMY) 10. Dr. Fattah Rahiman Ghazali (FRG) 11. Dr. Lau Chiew Chea (LCC) 12. Dr. Ahmad Aizuddin Mohamad Jamali (AAMJ) 13. Dr. Mohd Hafizuddin Husin (MHH) 14. Dr. Shafora Bibi Samri (SBS) 15. Dr. Zul Khairul Azwadi Ismail (ZKAI)	1. Dr. Nur Hartini Mohd Taib (NH)

9.5.2 PHASE II PRESENTATION FORMAT

9.5.2.1 Guidelines of Phase II Seminar Presentation

The format of teaching and learning (T & L) of Phase II M. Med (Radiology) is revised as to comply with the school philosophy. The department has agreed to use a combination of organ system-based and problem-based as the main T & L tool parallel with the school philosophy.

a. Case Selection

A real case should be selected and discussed with the respective lecturer before the presentation. The selection of the case must be based on the problem covered during the week (please refer to teaching timetable). The case should be proven radiologically and pathologically/surgically so that the findings and differentiating features can be discussed.

b. Case presentation

The relevant history and physical examination findings should be presented. The justification of the radiological investigation performed should be discussed. The significance in the management of the patient should be highlighted when the radiological findings presented i.e. the relevant findings, which help the clinician in managing the patient.

c. Discussion

Differentiating features

After the case presentation, thorough differentiating radiological features should be discussed. This discussion should be based on the case presented. This segment should be an interactive session with the floor. The presenter may need to show the typical radiological features (images) of the discussed topic to help the group understand the discussed topic. The reference should be based on the standard textbook and the recommended journal. The lecturer should direct and guide the session so that the discussion is focused on the topic discussed and beneficial to everyone.

This part should highlight the positive and negative relevance as to reach the provisional and differential diagnoses. The key words of description and radiological signs should be discussed thoroughly.

d. Updates of imaging and management

The presenter should present the latest imaging technique or updates of imaging regarding the discussed topic to the group. The discussion should also highlight the limitations of imaging and suggestions for optimum imaging.

9.5.2.2 Example of presentation format

Title: Chest Infection

Case presentation
A 12-year-old Malay boy was referred to the casualty for gradual onset of shortness of breath and fever for 1 week. Clinically he is febrile (T – 38C). On examination, the trachea is deviated to the left side. The chest expansion and breath sound are reduced on the right side. Stony dullness felt on the right hemithorax. Clinical diagnosis of pneumonia with of right pleural effusion was made.

A chest radiograph was performed. This is indicated as this investigation is readily available, fast and cheap. The image of the chest radiograph should be shown and discussed thoroughly. The findings show homogeneous opacity of the right hemithorax with deviation of trachea to the left. This is consistent with pushing effect in contrast to pulling effect. Thus, this is consistent with right pleural effusion. Differentiating the collapse lung and the pleural effusion is essential as in pleural effusion, chest tube drainage is needed.

A CT scan of thorax was then performed. This is done as there is no improvement after chest tube drainage. The suspicion of lung abscess is highlighted by the clinician. Images of the CT thorax should be shown and discussed. The right pleural effusion is again evident with the split pleural sign, pleural enhancement and the mass effect (pushing effect). Differentiating lung abscess and the pleural effusion is again necessary as the drainage approach is different.

Discussion
Differentiating features

i. Explain why the pleural effusion is evident. State and discuss all the features that support findings of pleural effusion. Why lung abscess is unlikely should be discussed.
ii. Explain the split pleural sign, pregnant lady sign etc.
iii. Explain also other significant signs and findings of chest infection i.e. consolidation (passive and pneumonic consolidation), interstitial opacities etc.

Updates of imaging and management.
An update from a recent protocol or journal should be selected and discussed briefly.

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