Study & Evaluation Scheme

of

M.D. (Radio Diagnosis)
[Applicable for the Batch 2014-15 till revised]

TEERTHANKER MAHAVEER UNIVERSITY

Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in

RADIO – DIAGNOSIS – M D

GOAL

Goal of the course is to orient and train the students on different aspects of diagnostic and Interventional radiology in the diseases of various organ systems of the human body. They should be able to apply this training at secondary and tertiary level of medical care.

OBJECTIVES

In order to achieve the goal of this course, following objectives are to be accomplished by the time the candidate completes the 3 years course.

Three broad domains of the objectives are:

1. Cognitive domain (knowledge)
2. Psychomotor domain (Skills)
3. Attitudinal domain (Human values, ethical practice etc.)

Congnitive Domain (Knowledge)

1. Describe aetiology, pathophysiology, and principles of diagnosis and management of common problems including emergencies, in adults and children.
2. Demonstrate understand of basic sciences relevant to this specialty.
3. Identify important determinants in a case (e.g. social, economic, and environmental) and take them into account for planning therapeutic measures.
4. Recognize conditions that may be outside the area of specialty/competence and to refer them to proper specialist or ask for help.
5. Advice regarding the management (including interventional radiology) of the Case and to carry out the management effectively.
6. Update oneself by self-study and by attending courses, seminars, conf erences and workshop which are relevant to the field of radio-Diagnosis.
7. Carry out guided research with the aim of publishing his/her work and presenting work at various scientific fora.

Psychomotor Domain (Skills)

1. Take a proper clinical history, examine the patient, perform essential diagnostic/interventional procedures and interpret the result to come to a reasonable diagnosis or differential diagnosis in the condition.
2. Provide basic life saving support service in emergency situations.
3. Undertake complete patient monitoring including the care of the patient.

Attitudinal Domain:-

1. Adopt ethical principles in all aspects of his/her practice. Professional honesty and integrity to be fostered.
2. Develop communication skill in order to explain the various options available in management and to obtain a true informed consent from the patient.
3. Be humble and accept the limitations of his knowledge and skills and to ask for help from colleagues/seniors when needed.

4. Respect patient rights and privileges including patient's right to information and right to seek a second opinion.

COURSE CONTENT

1. BASIC SCIENCE RELATED TO RADIO-DIAGNOSIS

- Radiation physics and Radio-Biology,
- Radiological anatomy and pathology of various organ systems
- Imaging Techniques,
- Radiography.

Includes all aspects of:- Fundamentals of electromagnetic r adiation, X-Ray production, characteristic properties of X-Rays, units of radiation, radiation measurement, X –Ray equipments, X-Ray films, intensifying screens, other X-Ray appliances, dark room equipments and procedures, II TV, cine fluorography, tomography.

Quality assurance
Radiation hazards and principle and methods of radiation protection.

Contrast media: types, chemistry, mechanisms of action, dose schedule, routes of administration, their potential adverse reactions and management.

Clinical applications of important isotopes and instrumentation in Nuclear medicine with advances in both.

Physics and applications of advanced imaging i.e., Ultrasound, CT, MRI Angiography (DSA), PET, SPECT, CR, DR, DF, flat panel detector system etc.

Practical experiments in physics: A list of experiments, which a resident should be able to do and interpret the results, is available in the department.

2. RESPIRATORY SYSTEM

GOAL
At the completion of the course the resident should be able to interpret conventional and advanced (CT, MRI) chest examinations, differentiating normal from abnormal cases and be able to recognize specific imaging pattern of different diseases.

Content Coverage
Diseases of the chest wall, diaphragm, pleura and airways; pulmonary infections; pulmonary vasculature; pulmonary neoplasm; diffuse lung disease; mediastinal disease; chest trauma; post – operative lung and X-Rays in intensive care.

Essential Objectives
a. Should be able to localize the chest pathology into one of the following compartments: pulmonar y, pleural, mediastinal, extra-pleural, extra-thoracic

diaphragmatic, infradiaphragmatic.

b. Recognize chest pathology that requires urgent or emergency treatment and describe this in an adequate manner: Pneumothorax, traumatic aortic rupture, esophageal rupture, acute pulmonary embolism, CHF and tracheo-bronchial foreign bodies.
c. Recognize acute and chronic patterns of bacterial and viral pneumonia's, occupational diseases, allergic states.
d. Recognize and acute and chronic cardiac failure patterns and non-cardiogenic edemas.
e. Understand the radiographic features and precipitating causes of adult and infant respiratory distress syndrome.
f. Recognize and describe appropriately various manifestations of benign and malignant neoplasms of the lung.

Evaluation

Resident's progress through daily observation of work.
At the end of the rotation an assessment by a small group of faculty.
Maintain a log book showing techniques learnt during the rotation – to be supervised.

3. GASTROINTESTINAL (GIT) AND HEPATO-BILIARY-PANCREATIC SYSTEM

Goal

At the completion of this course the resident should be able to interpret both the conventional and other newer (ultrasound, CT, MRI, angiography) examinations. This includes examination of GIT i.e., esophagus, upper gastrointestinal study, follow through for small bowel (including small bowel enterolysis) and enema (both conventional and double contrast) for colon. It also includes examination of liver, biliary system and pancreas using all the imaging modalities available to a radiologist including specialized investigations like ERCP, PTC and interventional procedures like abscess drainage, Percutaneous Transhe[patic biliary drainage (PTBD, internal and external), tumor embolization, Radiofrquency (RF) ablation etc.

During this posting resident also performs other investigations done using fluoroscopic guidance e.g; hysterosalpingography (HSG); fisulogram, sonogram, T-Tube cholangiography, sialography etc, and he/she should be able to perform and interpret studies using these modalities.

Content Coverage

Diseases and disorders of mouth, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, diseases of omentum, peritoneum and mesentery, acute abdomen, abdominal trauma using conventional and newer imaging methods like CT, MRI, DSA, isotope studies.
Diseases and disorders of hepato-biliary-pancreatic system using conventional & newer imaging methods.

Essential Objectives

a. Learn to evaluate the clinical condition & needs of a patient and to decide the appropriate studies and approach for examining the GIT or hepato-biliar y-pancreatic system of a patient.
b. Learn a proper approach to fluoroscopy; this includes developing proficiency in GIT fluoroscopy, mastering the equipment and using proper radiation protection measures (both for the patient and the operator).

c. Learn the basic pathology and patho-physiology of GIT/hepato-biliasr y- pancreatic diseases.
d. Learn to communicate the findings both at fluoroscopy and in films, in an accurate, succinct and meaningful way.

Evaluation:

Day to day observation of residents work including documentation and interpretation.

Assessment by a group of faculty at the end of the rotation.

Log book will be maintained of the procedures learnt.

4. GENITO-URINARY SYSTEM

Goal

At the completion of this course resident should be able to perform, direct the radiography and interpret the conventional radiological examinations of the urinary tract. These includes: excretory urography (intravenous pyeolgraphy); cystograms, micturating cystourethrography (MCU) and retrograde urethrography (RGU).

[HSG is included under GIT rotation].

In addition the resident should be able to perform and interpret other diagnostic imaging modalities and procedures which are used to evaluate urinary tract pathology i.e. ultrasound, CT, MRI, angiography, as well as various interventional procedures like percutaneous nephrostomy, kidney biopsy, stent placement, antegrade pyelography, tumor embolization etc.

Obstetrics and gynaelogy ultrasound: separate posting in III year.
Hysterosalpingography: already included with GIT posting.

Content Coverage

Imaging: conventional, ultrasound, CT ,MRI, angiography of various diseases and disorders of genitourinary system. These includes: congenital, inflammatory, traumatic, neoplastic, calculus and miscellaneous.

Essential Objectives

a. Recognize and evaluate emergency conditions involving the urinary tract including trauma, infection, vascular compromise and obstruction.

b. Recognize and understand the patho-physiology of stone disease.

c. Recognize patterns of infectious diseases and the modalities necessary for diagnostic evaluation.

d. Understand the complete evaluation of renal mass lesions and the evaluation other urinary tract neoplasma, including the detection and staging of the tumor.

e. Recognize the difference between the pattern of diseases affecting the genitor-urinary tract of adults and that of children and understand and identify the common conditions affecting the peadiatric genitor-urinary system on imaging.

Evaluation:

Day to day, based on daily work assessment.
By a group of faculty at the end of the posting.
Maintain a log book.

5. MUSCULO SKELETAL SYSTEM

Goal

At the end of the course the resident should be able to correctly interpret all the common abnormalities of the bones and joints. He/she should have a good understanding of the common congenital abnormalities, arthritis, bone and joint trauma, neoplastic conditions, metabolic bone disease and inflammatory diseases. He/She should also have an understanding of the role of CT/MRI in all these conditions and should be able to perform and interpret CT/MRI in diseases of musculo-skeletal system.

Content Coverage

Imaging (Conventional, ultrasound, CT, MRI, angiogr aphy, Radio-isotope studies) and interpretation of diseases of muscles, soft tissue, bones and joints including congenital, inflammatory, traumatic, neoplastic and miscellaneous conditions.

Essential Objectives

a. Communicate precisely and cogently radiographic descriptions of bone and joint trauma.
b. Differentiate various forms of arthritis and know correlative laboratory and clinical findings.
c. Enumerate the radiographic features that differentiate benign and malignant bone tumors with a basic familiarity of more common tumors.
d. Know radiographic features of acute and chronic osteomyelities and discitis (including tuberculosis).
e. Recognize differential features of osteoporosis (including Bone Mineral Density or BMD assessment techniques e.g; US, CT, Dexa) including various endocrine and metabolic diseases e.g; osteomalacia, hyperparathyroidism etc.
f. Know the application and interpretation of ultra sound/CT/MRI/angiography in one or more of the above situations.

Evaluation

Through daily sessions assessment.
By a small group of faculty at the end of posting.
Will maintain a log book.

6. CARIOVASCULAR RADIOLOGY/ECHO CARDIOGRAPHY

Goal

Goal is to provide experience in the role of imaging in cardiovascular diseases by different techniques including cardiac catheterization and cardiac angiography, Digital subtraction angiography (DSA) and interventional procedures in non cardiac arterial and venous diseases.

Content Coverage

Diseases and disorders of cardiovascular system including congentital conditions and the role of imaging by conventional, ultrasound, Echo, Color -Doppler, CT, MRI, angiography (including DSA) and radionuclide studies. It also includes interventional procedures e.g; ballown angioplasty, embolization etc.

Essential Objectives

a. Understand the anatomy and common pathology of congenital and acquired cardiac conditions.
b. Correlate plain film findings of common congenital abnormalities with those shown by angiography and explain the pathophysiology including abnormal pressure measurements.
c. Correlate plain film findings and the echocardiographic studies of patients with acquired valvular diseases and other common pathologic conditions including pericardial pathology.
d. Understand the role of newer modalities like CT/MRI, in aortic diseases e.g., aorto-arteritis, aortic dissection and aortic aneur ysm.
e. Should be able to perform fluoroscopy on patients before and after valve replacement and identify those with complications after valve replacement.
f. Understand the principle and logic behind various interventional procedures carried out in the cardiovascular labs e.g; PTCA, balloon dilatation of valvulr lesions, septostomy etc.

Evaluation

Day to day assessment.
By a small group of faculty.
Maintain a log book to be checked by faculty in charge.

7. NEURORADIOLOGY

Goal

At the end of the course the resident should be able to demonstrate reasonable proficiency in the assistance during performance as well as in the interpretation of all neuro-radiological studies. This includes angiograms, both cerebral and non-cerebral studies, transluminal angioplasties, embolization procedures and myelography. They should also be able to perform and interpret CT and MRI of head and spine.

Content Coverage

Includes imaging (using conventional and newer methods) and interpretation of various diseases and disorders of the head, neck and spine covering congenital lesions, infective lesions, vascular lesions, traumatic conditions and neoplasia. It also includes nunmberof interventional procedures carried out in the department of neuroradiology.

Essential Objectives

a. Know detailed normal neuro-imaging anatomy on different imaging modalities.

b. Identif y pathologic conditions (listed under the content on images acquired using different techniques and communicate the repost in a concise manner.
c. Participate in daily neuroradiology conferences held with the neurosurger y or neurology units.

Evaluation

Day to day based on reporting and procedures performed.
By a small group of faculty.
Will maintain a log book to be checked by faculty in neuroradiology.

8. GENERAL RADIOLOGY

Goal

In this rotation the resident learns to evaluate conventional radiographs. This includes radiographs of: chest, abdomen, pelvis, skull, spine, musculo-skeleton and soft tissues.Resident is posted in opd and indoor radiography rooms for this purpose.During indoor posting, he/she will also have the additional responsibility of directing, evaluating and reporting mammorgraphic procedures including related interventional procedures.

Essential objectives

a. Learns to direct and perform radiography on patients.
b. He/She should be able to decide on further imaging views based on the clinical suspicion and the initial imaging.
c. Write reports on the radiographs obtained in a methodical, concise and precise way and communicate it to the referring unit.
d. Present interesting cases in the departmental meets.

9. ULTRASOUND (INCLUDING GYNAE/OBSTETRICS)

Goal

At the completion of this rotation the resident should be able to perform and interpret all ultrasound studies. These studies include : abdomen, pelvis, small parts, neonatal head, color-duplex imaging (including peripheral i.e; extremity arterial and venous studies), obstetrics/gynaecology (in the deptt of Gyn/Obstet) and interventional procedures using ultrasound guidance. The resident should have a retroperitoneal structures, neck, chest, extremities and small parts (thyroid/parathyroid, scrotum, orbit, breast).

Essential objectives

a. Determine or select the appropriate diagnostic procedure for the clinical problem.
b. Demonstrate proficiency in patient scanning using appropriate techniques and instrumentations.
c. Modify the procedure, if required, based upon the observed abnormalities (Pathology).
d. Analyze the result of the diagnostic procedure, make diagnosis and record the findings.
e. Communicate findings, diagnostic and other relevant information to the referring physician.
f. Present interesting ultrasound cases in the departmental conferences/ meetings.

Evaluation

Ongoing basis using day to day work.
Presentations in departmental meets.
Maintain a log book.
By a group of faculty at end of the rotation.

10. C.T

Goal/Objectives

The goals/objectives to be achieved by the end of this rotation are:

a. Select CT protocol according to the clinical diagnosis. He/She should be able to direct and modify (if required) the performance of the CT examination.
b. Demonstrate knowledge of the CT findings of the common pathologic conditions occurring in the head, neck, chest, abdomen, pelvis, and in he soft tissues and musculo-skeletal system.
c. Resident should be familiar with both the conconventional and different modified CT techniques (High resolution, Dual phase, CT angio, BMD, multislice CT etc.)
d. interpret conventional and modified body CT examinations (including HRCT, dual/triple phase CT, CT portography, virtual CT etc.) with a reasonable degree of accuracy.
e. Demonstrate proficiency in verbal and written reporting f CT findings and differential diagnosis.
f. Demonstrate knowledge of the limitations (and potential fallacies) of CT imaging of various pathologic conditions and be able to perform correlations with other imaging modalities including formulations of recommendations for additional appropriate imaging procedures.
g. Perform CT guided biopsy procedures under guidance of seniors.
h. Present interesting cases of CT in the departmental meetings.

Essential Objectives

a. The resident will review the daily body CT schedule and based upon the known clinical information and review of other radiological studies of the same patient done earlier, select the most appropriate CT imaging protocol for the each patient. This may include altering an existing CT protocol to provide the most appropriate examination for an individual patient.
b. Develop a working knowledge of the actual performance of the CT examinations. This includes starting intravenous lines, amount and timing of injecting i.v. contrast, and actual operation of CT machine.
c. Review and report all the completed body CT examinations, initially this will be under the supervision of the seniors but later independently – but all reports will be signed by the faculty in charge.
d. Participate and present CT cases in departmental and inter departmental meets.

Evaluation

On daily basis after observing reporting and working in the CT room.
By a group of faculty.
Maintain a log book under the supervision of faculty in charge.

11. M.R.I.

Goal/Objectives

The goals/objectives to be achieved by the end of this rotation are:

a. Select MRI protocol according to the clinical diagnosis. He/She should be able to direct and modify (if required) the performance of the MRI examination.
b. Demonstrate knowledge of the MRI findings of the common pathologic conditions occurring in the head, neck, chest, abdomen, pelvis, and in he soft tissues and musculo-skeletal system.
c. Resident should be familiar with both the conventional and never sequences.
d. Interpret conventional and newer sequence MRI examinations with a reasonable degree of accuracy.
e. Demonstrate proficiency in verbal and written reporting of MRI findings and differential diagnosis.
f. Demonstrate knowledge of the limitations (and potential fallacies) of MRI imaging of various pathologic conditions and be able to perform correlations with other imaging modalities including formulations of recommendations for additional appropriate imaging procedures.
g. Perform MRI guided biopsy procedures under guidance of seniors.
h. Present interesting cases of MRI in the departmental meetings.

Essential Objectives

a. The resident will review the daily body MRI schedule and based upon the known clinical information and review of other radiologic studies of the same patient done earlier, select the most appropriate MRI imaging protocol for the each patient. This may include altering an existing MRI protocol to provide the most appropriate examination for an individual patient.
b. Develop a working knowledge of the actual performance of the MRI examinations. This includes starting intravenous lines, amount and timing of injecting i.v.contrast, and actual operation of MRI machine.
c. Review and report all the completed body MRI examinations, initially this will be under the supervision of the seniors but later independently – but all reports will be signed by the faculty in charge.
d. Participate and present MRI cases in departmental and inter departmental meets.

Evaluation

On daily basis after observing reporting and working in the MRI room.
By a group of faculty.
Maintain a log book under the supervision of faculty in charge.

12. ANGIOGRAPHY AND INTERVENTIONAL RADIOLOGY

Goal

At the completion, the resident should be able to perform the most common non-cerebral angiographic studies. He/she should have a good basic understanding of both; the vascular interventional radiologic procedures such as angioplasty, embolization using various embolizing agents; as well as the various non-vascular interventional procedures such as percutaneous nephrostomy, stenting, abscess drainage, PTC/PTBD, percutaneous biopsy, balloon dilatation of the esophagus etc. He/she should have a good understanding of the various equipments and available catheters and guidewires and other technical aspect of special procedures. In addition he/she should know all the potential risks and complications of these procedures and their management.

Essential objectives

a. Evaluate the requisition for appropriate clinical information to determine if additional information is needed.
b. Determine or select appropriate diagnostic procedure for the clinical problem.
c. Assisst and perform appropriate procedures under supervision and modify procedures based on observed abnormalities (pathology).
d. Know the potential risks and complications of procedures performed.
e. Know normal vascular anatomy applicable to angiographic procedures performed and know normal anatomy and landmarks to perform other non-vascular procedures.
f. Present interesting cases in the departmental meets.

Evaluation

Day to day evaluation.
By a group of faculty.
Will maintain a log book.

13. PAEDIATRIC RADIOLOGY

Goal

Intention is to train residents to perform common radiologic procedures and to be able to interpret paediatric studies in order that they can appropriately deal with examinations of children in a non paediatric hospital environment.

At the completion the resident should be able to interpret most of the conventional and newer paediatric examinations which includes; upper airways, chest, genitor-urinary, gastro-intestinal and musculo-skeletal systems. Resident should be familiar with many of the neurologic conditions encountered in neonates and children. Resident should also be able to perform transfontanelle cranial ultrasound.

Content Coverage:

Common diseases and disorders of different organ systems covering congenital inflammatory, traumatic, neoplastic and other miscellaneous conditions, using both conventional and newer imaging methods.

Essential Objectives

a. Understand the appropriate indications for various imaging procedures and determine that the patient has been properly prepar ed for the procedure.
b. Know the standard radiographic views for paediatric examinations.
c. Learn to recognize and evaluate imaging manifestations (on conventional and newer methods) of common paediatric conditions occurring in the head/neck, chest, abdomen / pelvis and in the musculo-skeleton.
d. Perform paediatric fluoroscopic examinations with skill and accuracy.
e. Understand and apply the knowledge and principle of radiation protection, both for the child and the operator.

14. RADIOLOGY IN EMERGENCY MEDICINE

Goal

At the end of the course, resident should be able to give an evaluation of the emergency radiographic examinations. He/she should also be familiar with medicolegal cases (MLC) procedures.

Essential Objectives

a. Determine and direct radiography in emergency patients and review and interpret the radiographs.
b. If study is incomplete then determine additional views or repeat views.
c. Know indications for limitations of the common emergency imaging procedures.
d. Communicate findings, diagnosis and other relevant information to the emergency room physician.
e. He/She should be able to perform (some under supervision) and interpret special imaging procedures needed in emergency room e.g; barium studies, excretory urography, CT, Ultrasound, Doppler and Angiography.

15. ONCOLOGIC RADIOLOGY

Goal

At the end of the rotation the resident should be able to interpret radiological investigations in patients with neoplastic diseases (both benign and malignant). He/She should be able to perform, interpret and diagnose these patients. The resident should be able to perform and interpret newer imaging technique like PET-CT, Elastography, RF ablation system etc.

Essential Objectives

a. Understand pathology and patho-physiology of common neoplasms.
b. Learn the algorithmic approach to image these patients based on the suspected disease, its biological behavior and potential and limitations of various imaging modalities.
c. Perform appropriate investigation (both conventional and newer methods), interpret the results and reach at a reasonable diagnosis/differential diagnosis based on the clinical and biochemical results.
d. Learn to communicate the results in a precise way in a written report to the concerned unit.
e. Present interesting cases in the departmental meets.

16. NUCLEAR MEDICINE

Goal

At the completion of this rotation the resident should be able to interpret common nuclear medicine examinations (including cardiac cases). He/she should be able to evaluate the examinations for completion and determine what further images (including non nuclear medicine) need to be done. He/she should have a good understanding of the physical and biological properties of the commonly used radiopharmaceuticals and become familiar with safe handling of isotopes and basic radiation safety measures while dealing with isotopes.

Essential objectives

a. Review all cases performed each day.
b. Interpret the results of the procedure and give an appropriate diagnosis.
c. Observe and help in some common procedures performed in the department (e.g. ;thyroid, kidney, bone, cardiac scans), understand the principle underlying the Procedure and the basis for using a particular isotope in an investigation.

Evaluation

Day to day by nuclear medicine staff.

DISSERTATION

Thesis

a. Every candidate pursuing MD degree course is required to carry out work on a selected research project under the guidance of a recognized post graduate teacher.
   The results of such a work shall be submitted in the form of a dissertation.
b. The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, comparison of results and drawing conclusions.
c. Chief guide will be from the department of Radio-Diagnosis while co-guides will be from either the department or other disciplines related to the dissertation topic.
d. Every candidate shall submit a thesis protocol to the Dean of the Institute in the prescribed proforma containing particulars of proposed dissertation work four months from the date of commencement of the course. The thesis protocol shall be sent through the proper channel.

Protocol in essence should consist of:-

- Introduction and objectives of the research project.
- Brief review of literature.
- Suggested material and methods.
- Bibliography.

e. Such thesis protocol will be reviewed and the dissertation topic will be registered by the Institute. No change in the dissertation topic or guide shall be made without prior approvl of the Dean of the Institute.
f. Submission of thesis. Discussion

Thesis will be submitted at the end of two and a half (2.5) years.
Thesis should consist of

- Introduction
- Review literature
- Aims and objectives
- Material and methods
- Result
- Discussion
- Summary and Conclusion

- Tables
- Annexure
- Bibliography

g. Two copies of dissertation thus prepared shall be submitted to the Dean JIPMER, six months before the final examination.
h. The dissertation shall be valued by two external examiners appointed by the Institute. Approval of dissertation work is an essential precondition for a candidate to appear in the final MD examination.

Dissertation is graded as follows:

- Highly commendable
- Commendble
- Satisfactory
- Rejected

MD (Radiodiagnosis), Posting Schedule
Total Duration: 3 years
Applied Physics and Basic Sciences

First year	**Second year**	**Third year**
Conventional Radiology (opd) -months Genitourinary-months Conventional Radiology, Including Paediatric Radiology (indoor) Observer Posting: 1.GIT -1.Month 2. Ultrasound – 1. Month 3. CT – 1month	Ultrasound (with interventions) CT (with intervantions) -2 months Angiography (with interventions) MRI – 2 months Cardiac Radiology -2 months Neuroradiology -2 months	Emergency Radiology (Casualty – 2months) Oncologic radiology (IRCH) - 2months Nuclear Medicine -1 month Obstet / Gyn (US) -15days Echocardiography -15days Ultrasound -1 month CT -1 month MRI -1 month Angiography -1 month Elective -2 months
Dissertation submission at the end of 2 ½ years.		

Classes on Statistics: A series of lectures held for every one

M.D. BRANCH VIII – RADIODIAGNOSIS

COURSE CONTENT;

Paper-I: - Radiological Anatomy, physiology, Pharmacology, Pathology, Biochemistry, Radiological Physics.

Paper-II: - Imaging of Chest, Cardiovascular System and Musculoskeletal system.

Paper-III: - Imaging of Gastrointestinal tract and abdomen, urogenital tract, Obstetrics & Gynaecology.

Paper-IV:- Imaging of Central Nervous System, Orbit, ENT, Dental, Soft tissues,Oncology, Endocrine Radiology, Nuclear Radiology, Recent Advances, Interventional Radiology and Miscellaneous.

PAPER – I

ANATOMY: Radiological anatomy consisting of : Relevant embryology of skull, central nervous system, cardiovascular system, respiratory, diaphragm, gastrointestinal tract, genitourinary tract, others; Radiological anatomy of facial planes of neck; pharynx, nasopharynx and larynx; Anatomy of heart and major vessels; Anatomy of ear, orbit, teeth; Anatomy of GIT including oesophagus, stomach, duodenum, small intestine, appendix, large bowel, rectum and its associated vascular supply; Genito – urinary system including kidneys, ureters, bladder, both male and female urethra and associated glands e.g. prostate, and reproductive organs; Sectional anatomy of entire abdomen and mediastinum; The venous and arterial systems of both extremities; Osteology; Joints of both extremities; Spine; Lymphatic system, breast, etc.

PHYSIOLOGY: Physiology of excretion; physiology of ventilation perfusion; pulmonary circulation; the cardiac cycle; the physiology of CSF flow; the physiology of renal hypertension; the physiology of menstrual cycle; the physiology of adrenal, thyroid function; physiology of various endocrine organs, their regulation and radiological correlation.

PATHOLOGY: Pathology of various systems of CNS, musculoskeletal systems, CIT, Diaphragm, GUT, CVS, RS, Reproductive systems (with special emphasis on tumours, infectious processes, congenital anomalies); pathology of radiation injury; pathology of inflammation, repair, necrosis, gangrene; pathology of vascular injury and repair; pathology of ischaemia; pathology of hematopoietic disorders, malignancies related to this system e.g. lymphomas, storage disorders e.g. Gaucher's disease and others.

PHARMACOLOGY: Pharmacology of materials injected into patients for diagnostic purposes including radio-nuclide agents; drugs used in the management of contract reactions, cardiovascular stabilization of contrast reactions; drugs for pharmacoangiography; drugs used during routine procedures such as barium, angiography etc; anticoagulants; drugs used to counter cerebral edema; captoprill etc.

BIOCHEMISTRY: Elementary Radiation biology; biochemistry of endocrine glands.

RADIATION PHYSICS: Fundamentals of electricity; heating effect of current – units of measurement of work, ener gy, power; electromagnetic induction – principles of production of AC & DC, peak values, RMS values and average value of AC; basics of transformers -efficiency of transformers; rectifiers and rectification – timers; X - ray - production and properties, modern x-ray tubes, quantity of x-ray (Roentgen, RAD, REM) interaction of x- rays with matters; filters in

Radiology; physical principles of x-ray diagnosis; fluorescence– screens; high KV technique; foreign body localization; Basic principles of image intensification, digital and cine radiography, ultrasound, CT scan, MRI, PET-CT,SPECT, CR, DR, DF & flat panel detector. Radioisotopes – production, structure, basic instruments in their use, physical properties; radiation protection - maximum permissible dose – film badge – methods of protection - safe handling of radio-active isotopes – safe disposal of radioactive material.

PAPERS - II, III, IV

1. RADIOGRAPHIC TECHNIQUES AND PROCESSING.
2. PRINCIPLES OF RADIOGRAPHIC/OTHER IMAGING MODLITIES (as defined above –refer definition of Radio – Diagnosis). DIAGNOSIS OF DISEASES OF

THE:

BONES & JOINTS: Congenital skeletal anomalies, skeletal dysplasias, chromosomal disorders; periosteal reaction, bone and joint infections, sarcoid; Avascular necrosis of bone, osteochondritis, miscellaneous bone lesions e.g. Caisson's disease, caffey's disease, progreia, Paget's disease, Leontiasis Ossea, Tuberous Sclerosis; Diseases of joints, arthrography; Tumors and Tumor like conditions of bone; Disorders of the lymphoreticular system and other hemopoeitic metabolic and endocrine origin including rickets, osteomalacia, scurvy, osteoporosis, quantitative analysis of bone, hemochromatosis Wilson's disease, hyperparathyroidism and others; skeletal trauma – general and regional; Radionuclide bone scanning.

CHEST: Normal chest, methods of investigation and differential diagnosis; Mediastinum; The pleura – collapse and consolidation: Tumours of the lung; Inflammatory diseases of the lung; Chronic bronchitis and emphysema, pneumoconiosis; Chest trauma, the post operative chest, intensive care; radiation; The pediatric chest; Miscellaneous lung conditions e.g.sarcoidosis, fibrosing alveolitis, extrinsic alveolitis pulmonary eosinophilic conditions, asthma, eosinophil granuloma, pulmonary haemorrhage and hemosiderosis, lymphoproliferative disorders, granulomatous such as Wegners lymphomatoid, bronchocentric, interstitial pneumonias, connective tissue disorders, pulmonary alveolar proteinosis, amyloidosis, bronchial abnormalities such as bronchitis, bronchiectasis etc., adult respiratory distress syndrome, pulmonary ossification, oxygen toxicity, pulmonary alveolar microlithiasis; lungs in chronic renal failure, shock etc.

CARDIOVASCULAR SYSTEM: The normal heart, methods of examination by radiography, ultrasound, angiography, cardiac catheterization, CT scanning, MRI, Radionucleide imaging; the pericardium; the pulmonary circulation; acquired hear disease – e.g. ischaemic, valvular, cardiomyopathies etc., congenital heart disease - general consideration and specific condition –emphasis to be laid on ultrasonographic and angiographic profiles; arteriography and therapeutic angiography; phlebography; the lymphatic system.

GASTROINTESTNAL TRACT AND ABDOMEN: Methods of examination -radiography and contrast, studies, C.T. and endoscopic procedures; salivary glands, pharynx and oesophagus; stomach and duodenum; the small bowel; the colon; the acute abdomen; the biliary tract; the liver, spleen and pancreas; the adrenal glands; the pediatric abdomen; interventional procedures.

UROGENITAL TRACT: Methods of examination including radiography contrast studies, ultrasonography, CT scanning, nuclear medicine and other imaging modalities, congenital lesions of upper and lower urinar y/genital tract; cystic diseases of the kidney, tumours of the kidney tumour of the kidney and ureter; renal calculi, nephrocalcinosis; uninary infection; renal vascular

disease, miscellaneous lesions such as hypertension and renal artery stenosis, small artery disease, radiation nephritis, vascular malformations of the renal artery,arteriovenous fistulae, fibrosis,pyeloureteritis cystica, hydroureter of pregnancy; trauma to the urinary tract – renal injury, ureteric injury, lower urinary tract injuries, methods of examination - contrast studies, radionuclide studies, Computed Tomography etc; the bladder and prostate; lower urinary tract obstruction, incontinence, postprostectomy problems, obstetric and gynaecological imaging with special emphasis on ultrasound of various disorders of these regions; imaging in renal transplantation; interventional procedure.

CENTRAL NERVOUS SYSTEM: Anatomy, pathology and methods of examination including radiography, contrast studies, CT,MRI Doppler studies of carotids and others; the normal skull - radiography of the various views of the skull, various anatomical landmarks within the skull, CT anatomy of the skull and its contents, MRI anatomy of the skull and its contents; the abnormal skull comprising all bony and non-bony lesions of the skull and its contents; intracranial calcifications - normal and pathological; neuro –radiology of the spine with emphasis on myelography, CT and MRI; cr anial trauma; infections and inflammation of the brain; diseases of white matter; cranial and intracranial tumours; sellar and parasellar regions; congenital anomalies; cerebrovascular diseases; craniovertebral junction imaging - anomalies and acquired lesions; cerebral blood flow determination; neurosonography ; hydrocephalus - imaging.

ENT/ORBIT/TEETH/SOFT TISSUES : Pharynx and larynx - anatomy, methods of examination of healthy and diseased pharynx and lar ynx; the paranasnl sinuses; petrous temporal bone with emphasis on high resolution CT scanning of this area; the orbit and eye; the teeth and jaws; the soft tissues; breast, mammography, xero-radiography and thermography etc.

MODERN IMAGING/RECENT ADVANCES: CT scanning of CNS/thorax / abdomen/ pelvis/ extremities – emphasis on normal CT anatomy and CT of abnormal structures of various parts of the body; MRI - technical aspects, CNS and spine, recent advances in imaging of thoracic and abdominal lesions - a knowledge of NMR spectroscopy is desirable; PET,SPECT,CR,DR,DF, flat panel detector system-- technical aspects and clinical applications, Radio – isotope imaging, various radio-nucleide agents, their technical aspects and clinical applications, Gama Camera – technical aspects Ultrasound of - abdomen including major organs like liver, kidney and others, Obstetric & Gynaecological ultrasonography with special emphasis to cardiovascular ultrasonography, peripheral vascular studies, neonatal skull etc., technical aspects of ultrasonography, basis interventional techniques utilizing ultrasonography.

OBSTERTRICS RADIOLOGY : Obstetrics/Fetal sonography - basic ultrasound examination of the uncomplicted pregnancy, ultrasound in all the three trimesters of pregnancy, sonographic estimation of fetal age and weight, sonographic evaluation of maternal disorders during pregnancy, fetal CNS abnormalities, fetal genitourinary tract/thorax/abdomen, sonography of multiple gestation, ultrasound evaluation of placenta. Assessment of fetal well being, Duplex Doppler system in obstetrics ultrasound, evaluation of high risk pregnancy, invasive fetal procedures, ectopic pregnancy, IUGR, others.

Obstetrics Radiography: Amniography, Pelvimetry, radiography of maternal abdomen, radiation hazards, feta death.

GYNAECOLOGICAL RADIOLOGY: PLAIN radiography, hysterosalpingography and other contrast study, the unr inary tract in gynaecology, congenital abnormality of female genital tract, inflammatory disease of the female genital tract, uterine tumours, uterus, cysts and tumors of the

ovary, intrauterine contraceptive device, CT/MRI of female pelvis, normal anatomy of the female pelvis.

Ultrasonography: Ultrasonic evaluation of the uterus, gestations, trophoblastic disease, the Ovary.

IMAGING IN ONCOLOGY.

ENDOCRINE RADIOLOGY.

ULTRASONOGRAPHY OF SMALL ORGANS.

INTERVENTIONAL RADIOLOGY: All imaging guided interventional procedures. Biopsy procedure percutaneous transthoracic/abdominal/musculoskeletal biopsies; percutaneous punctures, decompression and drainage procedure.

SCHEME FOR CLINICAL / PRACTICAL AND ORAL EXAMINATIONS

CLINICAL / PRACTICAL

1. Long case : 100 marks
2. Short case : 75 x 2 = 150 marks
3. Spotters : 50 marks

ORAL : 100 marks

Total : 400 marks