

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



CURRICULUM / STATUTES/ REGULATIONS

FOR 4 YEARS MD Diagnostic Radiology

Faisalabad Medical University

Faisalabad

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Section A

VISION STATEMENT:

Faisalabad Medical University has been established since 05-05-2017 for purpose of imparting better medical education and encouraging and arranging extensive research and publication in the field of medical science. The vision of university is:

“Striving to achieve national and international stature in undergraduate and postgraduate medical education with strong emphasis on professionalism, leadership, community health services, research and bioethics”

MISSION STATEMENT

The mission of the University is:

“Educate Healthcare professionals to prevent, diagnose and treat human illnesses to practice evidence-based medicine with focus on lifelong healthcare in order to meet the challenges of community needs and competitive medical profession at the same time”

STATUTES

Nomenclature

The name of degree programmer shall be MD Diagnostic Radiology.

Course Title:

MD Diagnostic Radiology

Training Centers

Department of Diagnostic Radiology in Affiliated hospitals of Faisalabad Medical University, Faisalabad.

Duration of Course

The duration of course shall be four (4) years with structured training in a recognized department under the guidance of an approved supervisor.

Course structure:

1. **Core knowledge:** Competency based learning for trainees. (2 exams to be conducted by university at mid and end of Programme. Continuous internal assessment to be included throughout the Programme which is conducted by the department which will carry weightage in final assessment.

Section C:
AIMS AND OBJECTIVES OF THE
COURSE

AIM

The aim of four years MD programme in Diagnostic Radiology is to train residents to acquire the competency of a specialist in the relevant field so that they can become

2.Skills:

At the end of the program, the Trainee should be able to:

Record H&PE and F/U notes and deliver complete oral presentations to fellow colleagues on the basis of these documents.

Elicit **abnormal physical signs** and interpreting their significance.

Interpret basic as well as advanced **laboratory data** as related to the disorder/disease.

. Interpret laboratory tests and related tests that include CBC, chemical tests, electrocardiogram, CXRs, PFTs, and body fluid cytology. Furthermore, students will better understand the need to incorporate sensitivity, specificity and pre-test probabilities, and Bayes theory in planning tests according to patients' symptoms and signs.

7. Form **differential diagnosis** with up-to-date scientific evidence and clinical judgment using history and physical examination data and the development of a prioritized problem list to select tests and make effective therapeutic decisions.

Perform effective non-invasive and invasive procedures that are essential for the practice of general internal medicine. This includes expertise in the ability to obtain informed consent, act through appropriate indicators and contra-indicators, interpret the findings and evaluate results, and handle related procedural issues identified in the plan.

Practice evidence-based learning about research and scientific knowledge about Diagnostic Radiology through training in Research Methodology

Utilize the medical literature to expand one's knowledge base and to search for answer to medical problems. They will keep abreast of the current literature and be able to integrate it to clinical practice.

	General radiographic anatomy as well as cross sectional imaging anatomy	Small group teaching Power point presentations/ tutorials	OPD/ IPD
Full range of ultrasound physics and procedures	<ul style="list-style-type: none"> • Hepatobiliary USG • Physics of Ultra sound chest, abdomen, pelvis small parts and MSK • Color Doppler ultrasound 	Small group teaching/ Patient based learning	IPD/OPD

2nd year

Sr#	Outcomes	Content covered	Teaching and learning methods	Setting
2 nd calendar year	<p>Start of formal training in radiology</p> <p>To have understanding and reporting of Radiological skills and procedures</p>	<p><u>(Detail given in the section C)</u></p> <ul style="list-style-type: none"> • Plain film • Barium Enema • Barium Meal • Small Bowel Barium Enema • Sialogram • T-Tube cholangiogram • Knee Arthrogram • Sinogram/Fistulogram • Leg Venogram • Angiographic Examination • Hysterosalpingogram • Lymphangiogram • Ultrasound of the abdomen • Obstetrics and Gynecology • Neonatal Brain • Angiography • Myelogram • Retrograde pyelogram • Ultrasound of small and superficial parts • Mammogram 	<p>Small group teaching/ Patient based learning</p>	OPD/ IPD

	Remaining three workshops	a) Basic Biostatistics & Research Methodology. b) Information Technology Skills c) Initial Life Support (ILS)	Small group teaching	Workshop halls
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4th year

Sr#	Outcomes	Content covered	Teaching and learning methods	Setting
4th year	Radiology related to clinic problems Child radiology	<ul style="list-style-type: none"> • Airways on chest x-ray of child • Bone age according to radiographic findings • Normal vs. abnormal findings on skeletal radiographs 	Small group teaching Patient based learning	OPD/ IPD

	Radiology protection	<ul style="list-style-type: none"> • X-ray tube and x-rays • CT • Radiation Protection Program in Radiology • Auditing • Safety and personal monitoring • Dose reduction strategies • Public radiation protection • Documentation of therapeutic procedures • Audits • Reporting and dissemination of information • Quality management • Equipment selection, installation, and shipping • External checks 	Small group teaching Patient based learning	
	Emergency radiology Medico legal case training	<ul style="list-style-type: none"> • Evaluation of emergency radiographic tests • Communication of diagnostic and of the relevant information to the emergency room physician • The essential exposure of medico legal cases is added in the curriculum of residents of MD for certain time period which is beneficial for their practical work and making them capable to deal medico legal cases professionally. 		OPD/ IPD
	Thesis completion & submission	<ul style="list-style-type: none"> • Mandatory for final assessment 		

Details of the content

Year first

PHYSICS

- Introduction*
- Common properties of radiation and matter.
- Electromagnetic radiation*
- Spectrum

Radioactivity

- Exponential decay
- Radioactive decay schemes
- Basic knowledge of reactors.

X-ray production

- Principles
- Factors that control the type of x-ray output.
 - Tube rating*
 - Anodes that are stationary and rotating.
 - Exposure time

Interaction

- X-ray and gamma ray interaction and its effects on irradiated objects.
- Effects: heat, excitation, ionization, secondary electron range, chemicals, photographic, fluorescent, phosphorescent, thermoluminescent.
- X and gamma rays measurement*
- Quantity: ionization, TLD, and image dosimetry.
- Measurement of radionuclide detection rate.

X-ray interaction with the patient

- Energy loss in various body tissues, high voltage radiography mammography, enhancement with different contrast agents.
- Radiological image*
- Image quality: definition, resolution, noise, description, and contrast.

Image receptor

- Intensifying screens: construction, principles, and uses.
- Speed
- Automatic processor of x-ray films.
- Management and maintenance.
- Image intensity: construction, performance, light gain, visual integration, tv systems.

Scattered rays:

- Control of scatter.
- Techniques using radiographic subtraction.
- Radiation Protection***
- Biological effects of radiation, risk of somatic and genetic effects.
- Radiation protection objectives.
- Radiation protection regulations.
- Population radiation dose leading to somatic and genetic effects.

Quality assurance:

- Methods of assessing image quality
- Specialized training in Radiology**

Content of the program

- Specialized training in Radiology
- Mandatory rotations
- Research and writing of thesis
- Logbook maintenance

Year 2:

- Special Investigations (USG, CT and MRI) and their techniques
- Contrast Media and Pharmacological Aids to Radiology and their techniques
- General radiology anatomy
- Cross sectional imaging anatomy

Year 3:

- Radiological manifestations of systemic diseases using all diagnostic methods

RESPIRATORY RADIOLOGY:

Pulmonary Radiology

- Chronic obstructive airway disease
- Vascular pathology
- Lung cancer
- Heart failure and PE
- Lung collapse/consolidation
- Pneumothorax
- Pulmonary hyperinflation
- Tumors of the lung and mediastinum
- Chest wall, diaphragm, and pleura
- Occupational diseases
- Pulmonary collagen diseases

CARDIAC RADIOLOGY

- Pericardium
- Vascular disease:
 - Venous
 - Arterial
 - Lymphatic

MUSCULOSKELETAL RADIOLOGY:

- Congenital skeletal anomalies
- Bone and joint infections
- Disorders of the lymphoreticular system and other hemopoietic diseases
- Trauma to arms and legs
- Fracture of scaphoid and other wrist bones
- Fractures of the pelvis
- Osteoblastic and osteolytic metastases
- Fracture of the cervical spine and dislocation
- Infection of bones and joints
- Soft tissue and osseous neoplasms
- Investigate spinal cord injury
- Rheumatoid arthritis

- Diagnosis of hematological disease including anemia and leukemia

ABDOMINAL RADIOLOGY:

- Salivary glands
- Colon
- Adrenal glands
- Abdominal pain
- Trauma of the abdomen
- Hepatitis
- Hepatobiliary disorders
- Colitis
- Vascular disorders
- Cholelithiasis

NEPHRO-URO-RADIOLOGY:

- Congenital lesion
- Urinary tract infection
- Gynecologic radiology
- Mammography requirements and standards
- Pathologic and mammographic appearance, important clinical features, and malignant breast disorder prognosis
- Need for mammographic correlation.
- Kidney failure and urinary retention
- Tumors
- Investigation of possible pregnancies, including ectopic pregnancies.
- Female tumors

CENTRAL NERVOUS SYSTEM RADIOLOGY:

- Normal skull
- Spinal cord disease
- Trauma to head
- Disorders of the spinal cord
- Nose and ear infections
- Diseases of the paranasal sinuses
- Salivary gland disorders

RADIOLOGY of the head and neck

- Imaging Modalities (including current indicators, radiation exposure, IV contrast use)
- Petrous temporal bone
- Eye and orbit
- Oral cavity

RADIOLOGY OF GRANDULAR AND MAMMARY DISEASES

- Benign and malignant breast diseases

YEAR 4

EMERGENCY RADIOLOGY:

- Evaluation of emergency radiographic tests
- Emergency radiographic examination
- Medico legal cases (MLC) procedures
- Indications and limitations of common emergency imaging procedures
- Findings, diagnosis, and other relevant information to emergency room doctor
- Special diagnostic procedures required in the emergency room e.g.; barium studies, excretory urography, CT, ultrasound, Doppler, and angiography
- Communication of diagnosis, and other relevant information to the emergency room physician
- Radiology related to clinical problems

CLINICAL RADIOLOGY

- Airways on chest x-ray of child
- Bone age according to radiographic findings
- Normal vs. abnormal findings on skeletal radiographs
- Diseases in children
- Diseases of the chest and intestinal tract in childhood, as well as certain neoplasms in children.

RADIATION PROTECTION:

- X-ray tube and x-rays
- CT
- Radiation Protection Program in Radiology
- Auditing
- Safety and personal monitoring
- Dose reduction strategies

- Public radiation protection
- Documentation of therapeutic procedures
- Audits
- Reporting and dissemination of information
- Quality management
- Equipment selection, installation, and shipping
- External checks

Medico legal case training.

Advanced professional Education in Radiology (Theory and skills)

“The aim of the curriculum Content for phase II Education is to produce well-trained competent clinical radiologists.”

Trainees graduating from MD Radiology training will have formal education, clinical knowledge, and will be able to demonstrate competency in the following ways: -

- Explain the etiology and diagnostic and management principles of common adult and pediatric diseases and emergencies.
- Demonstrate basic scientific understanding of Diagnostic Radiology.
- Take the relevant history, perform examination, perform appropriate diagnostic/intervention procedure and use this data to reach a reasonable diagnosis or establish differential diagnosis.
- Provide emergency life-saving support.
- Demonstrate judicious imaging practices with appropriate clinic radiologic indicators and show knowledge of following scientific principles:
 - Fundamental radiation biology and radiation safety
 - Tracer technology

- Treatment applications: fundamentals of radionuclide therapy; treatment of hyperthyroidism, thyroid malignancy, and bone pains related to metastases.
- Diagnostic and therapeutic imaging in thyroid disorders.
- Computer processing and image processing.
- Linear and threshold hypotheses for biological response to radiations of low level.
- Radiopharmaceuticals
- Radionuclide production using reactors, cyclotrons, and/or radionuclide generators.
- Radiology techniques including DEXA scan, USG, Computed tomography, and Magnetic resonance imaging.
- Correlative assessment of Nuclear medicine images with other imaging modalities.
- Treatment applications.
- The use of radiolabeled antibodies (monoclonal) and peptides in the treatment of tumors
- State physiological properties, concentrations, and appropriate indications for following dyes:
 - Ba
 - IV contrast media
- Discuss details about Glucagon including:
 - The appropriate indicators and doses used in gastrointestinal radiology.
 - Adverse effects.
- Make a list of high-risk allergies to contrast media and appropriate management.
- Show basic information about radiographic anomalies.
- Demonstrate basic information about fluoroscopy equipment, including appropriate kV techniques, radiation protection features, and appropriate radiation protection techniques.
- Demonstrate information about appropriate kV techniques and patient postures.
- Given fluoroscopic tests, demonstrate the ability to diagnose abnormal fluoroscopy and change the procedure or patient positioning to obtain further diagnostic images.
- Evaluate and compile data from other modalities and make suggestions to the concerned physician regarding the most appropriate next imaging investigation for patient evaluation.
- Mention technical indicators and interpret defecography.
- Discuss the full range of USG procedures and findings in:
 - Hepatobiliary ultrasound
 - Ultrasound of the pelvis

- Color Doppler ultrasound
- Discuss the basics of ultrasound physics and equipment, especially related to its operation.
- Discuss different aspects of USG and radiographic images, including indications, pathologies, and further investigations for the following organ systems:
 - Hepatobiliary pathology
 - Renal disorders
 - Neonatal head pathology
 - Barium studies
 - ERCP
 - IVU
 - MCUG
- Demonstrate detailed information about the anatomy, fundamentals of imaging and its interpretation, and differential diagnoses of the following systemic disorders:

Section D

PROGRAMME FORMAT

1st calendar year

- After admission in MD radiology Program the resident will spend first 6 Months in the relevant Department of radiology as Induction period during which resident will get orientation about the chosen discipline.
- 6months orientation period
- 4weeks rotations of general_medicine covering basic principles of medicine in relation to radiology
- 4 weeks rotation of general surgery covering basic principle of general surgery in relation to radiology.
- 8 weeks rotation of nuclear medicine (PINUM)
- 8 weeks rotation of international vascular radiology. (FIC)

2nd Calendar year

- Start of formal training in radiology
- 2 Mandatory workshops
- Synopsis submission
- Intermediate examination at the end of 2nd calendar year

3rd Calendar year

- Radiological skills and procedures
- Radiological manifestation of systemic Diseases using all diagnostic methods

4th Calendar year

- Thesis completion and submission OR 2 research paper be completed and published in journal recognized by PMDC
- Radiology related to clinical problems
- Child radiology
- Radiological protection
- Medico legal case MLC training

Sr #	Ward	Duration	Content	Institute
1	General Medicine	4 Weeks	<ul style="list-style-type: none"> • Ethics of medical practice • orientation of IPD or OPD lab • History taking • Systemic examination • Special investigation • Radiological correlation of basic medical conditions • CLD • CKD • COPD 	FMU & affiliated Hospitals
2	General Surgery	4 Weeks	<p>Surgical history</p> <ul style="list-style-type: none"> • Surgical examination • Principles of basic radiography For diagnoses and intervention • Radiological correlation of basic surgical conditions • Acute abdomen • Appendicitis • Pleural effusion • Pneumothorax • Hemothorax 	FMU & affiliated Hospitals
3	Nuclear Medicine	8 Weeks	<ul style="list-style-type: none"> • Clinical indications, general procedures (including radiopharmaceutical and dose), and scintigraphic findings in: • Pulmonary (embolism) perfusion and ventilation imaging • Osseous imaging • The basic principles of physics of nuclear medicine images and instruments • Nuclear studies, including indicators, diseases, protocols, related studies, radiopharmaceuticals used for each study, and various parameters that may affect the results of the process • Studies of myocardial perfusion (rest and stress) • Radiopharmaceuticals used in cardiovascular nuclear studies, including methods for labeling red cells, patient doses, 	PINUM

			<p>and isotopes.</p> <ul style="list-style-type: none"> • Patient dose calculation, using information regarding nuclear decay, volume concentration, and patient parameters 	
	Interventional and Vascular radiology	8 weeks	<ul style="list-style-type: none"> • Ultrasound (including Doppler) • IV and intra-arterial angiography • CT angiography • Aortography • Venography • Arterial and venous catheterization • Principles and monitoring of interventional radiology • Technique of Selinger's procedure for obtaining indiscriminate vascular access to normal and diseased arteries • Basic and advanced guidewire exchange techniques • Vascular access devices that are not working at all or are not working properly. • Pathophysiology of all diseases especially peripheral vascular disease, reno vascular hypertension, carotid occlusive disease, venous thromboembolic disease, biliary and genitourinary obstruction, and abscesses • Basic and advanced principles of thrombolysis • Vascular access principles including PICCs, tunneled and dialysis catheters. 	FIC

Section E:

Assessment Plan:

Examinations

Program duration	Course contents	Assessment method
At the end of 2 nd year of program	<ol style="list-style-type: none"> 1. Revision of core MBBS component including basic and clinical components. 2. Basic knowledge and Acquiring skill related to the specialty according to the objectives made. <ol style="list-style-type: none"> 1. First 2 mandatory Workshops as described in course outline. 3. Submission of synopsis 	<p>Intermediate Examination: to be taken by university. It will include:</p> <p>a) Written=300 b) TOACS / FILMS REPORTING + TABLE VIVA=300</p> <p>Total Marks =600</p>

<p>At the end of 4th/5 year</p>	<ol style="list-style-type: none"> 1. Training to act as an individual while managing patient or performing any task as defined by the objectives. 2. Training to act as a teacher, researcher, leader and a player in a team. 3. Overall development of a health care professional with all the set competencies of the Program. 4. All the mandatory and specialty oriented workshops to be completed as mentioned in the curriculum 5. Rotations as described in the curriculum completed 6. Thesis completion and submission 	<p>Final Examination to be conducted by university.</p> <p>It will include:</p> <p>a) Written=300</p> <p>b) TOACS/ FILMS REPORTING + TABLE VIVA=300</p> <p>c)Continuous internal assessment=100</p> <p>Thesis evaluation =300</p> <p style="text-align: center;">Total marks=600+100+300=</p> <p style="text-align: center;">1000</p>
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Components of Intermediate Examination

- Written: Total Marks =300
- Clinical, TOACS/ TABLE VIVA = 300

Total = 600

Components of Final Examination:

- Written: 300 Marks
- Clinical, TOACS and VIVA = 300 Marks
- Continuous internal assessment =100
- Thesis Evaluation = 300 Marks

Total = 1000 Marks

Intermediate Examinations:

Intermediate examination would be conducted for the candidate getting training, at the end of 2nd calendar year of the program.

Eligibility Criteria:

1. Candidate remained on institution roll during the period approved for appearing in examination.
2. Certificate of completion of mandatory workshops.
3. Completion of Log book signed by supervisor/concerned Head of Department.
4. Certificate of submission of Ethical Review Committee approved synopsis to the university if required as per rules of synopsis submission.
5. Evidence of payment of examination fee as prescribed by the University from time to time.
6. Certificates submitted through Principal/Dean/Head of academic institution shall be accepted as valid towards the candidature of an applicant.
7. submission of application for the examination and the conduct of examination.

Intermediate Examination Schedule and Fee:

- a) Intermediate Examination at completion of two years training, will be held twice a year.
- b) There will be a minimum period of 30 days between submission of application for the examination and the conduction of examination.
- c) Examination fee will be determined periodically by the University.
- d) The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.
- e) The Controller of Examinations will issue Roll Number Slips on receipt of prescribed application form, documents satisfying eligibility criteria and evidence of payment of examination fee.

Written Examination:

The written examination will consist of 100 single best answer type Multiple Choice Questions. Each correct answer in the multiple-choice question paper will carry 02 marks. The short essay question will be clinical scenario or practice based, and each question will carry 10 marks.

The marks of written exam will be divided as follows:

- MCQs = 200 Marks (100 MCQs, 02 Marks for each MCQ)
- SEQ = 100 marks (10 SEQs, 10 Marks for each SEQ)

Declaration of Results

The candidates scoring 60% marks in the written examination will be considered pass and will then be eligible to appear in the clinical and oral examination.

Clinical, TOACS/OSCE:

The clinical and TOAC/OSCE & Oral examination will evaluate patient care competencies in detail,

The examination will be of 300 total marks consisting of the following components

Clinical, TOACS = Total Marks 300

a) FILMS REPORTING = 120 marks (20 films with 06 marks each)

b) TABLE VIVA = 180 marks (06 station with 30 marks each)

- There are total 06 stations for table viva :
 1. Gastrointestinal tract system
 2. Genitourinary system / small parts
 3. Musculoskeleton system
 4. Pediatrics
 5. CNS / head and neck
 6. Chest / CVS

Declaration of Results

- A student scoring 60% in films reporting, 60% in short cases ad 60% in Table VIVA will be considered pass in the examination.
- A maximum total of four consecutive attempts (availed or un availed) will be allowed in the Intermediate Examination during which the candidate will be allowed to continue his training program. If the candidate fails to pass his Intermediate Examination within the above-mentioned limit of four attempts, the candidate shall have to take entire intermediate examination including written examination again.

Final Examination

(at the end of 4th Calendar year of the program)

Eligibility Criteria:

To appear in the Final Examination the candidate shall be required:

1. Result card showing that the candidate has passed intermediate Examination.
2. Certificate of completion of 4 Years training duly signed by Supervisor, Head of parent Department and that of the Head of Department where rotations were done (if prescribed in the curriculum).
3. Evidence of thesis submission to Department of Examination of the University.
4. Evidence of payment of examination fee as prescribed by the university from time to time.
5. The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.
6. Candidate remained on institution roll during the period required for appearing in examination.
7. Only those certificates, submitted through Principal/Dean/Head of academic institution shall be accepted.

Final Examination Schedule and Fee:

- a) Final examination will be held twice a year i.e. at least six months apart.
- b) Examination fee will be determined and varied at periodic intervals by the University.
- c) The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.
- d) The Controller of Examinations will issue an Admittance Card with a photograph of the candidate on receipt of prescribed application form, documents satisfying eligibility criteria and evidence of payment of examination fee. This card will also show the Roll Number, date / time and venue of examination.

Written Part of Final Examination

a) The written examination will consist of 100 single best answer type Multiple Choice Questions (MCQs) and 10 Short Essay Questions (SEQs). Each correct answer in the Multiple-Choice Question paper will carry 02 marks. Each Short Essay Question will carry 10 marks.

b) The Total Marks of the Written Examination will be 300 and to be divided as follows:

- Multiple Choice Question paper Total Marks = 200 (100 MCQs with 02 marks each)
- Short Essay Question paper Total Marks = 100 (10 SEQs with 10 marks each)

Total=300

Paper 1

- MCQs 100 (2marks each)

Paper 2

- SEQs 10 (10 marks each)
 - a. Paper 1 shall comprise of hundred (100) "single best answer" type Multiple Choice Questions. Each Question shall carry 02 marks.
 - b. Paper 2 shall comprise of ten (10) Short Essay Questions, each carrying 10 marks.

Declaration of Results

- c. The candidates scoring 60% marks in aggregate of Paper 1 and Paper 2 of the written examination will be declared pass and will become eligible to appear in the Clinical Examination.

Clinical, TOACS/Films Reporting and Table VIVA:

a) The Total Marks of Clinical and TOACs & Oral will be 300 and to be divided as follows:

a) FILMS REPORTING/ TOACs = 120 marks (20 films with 06 marks each)

b) TABLE VIVA = 180 marks (06 stations with 30 marks each)

Total= 300

Declaration of Results

- A student scoring 60% in films reporting, 60% in short cases and 60% in Table VIVA will be considered pass in the examination.
- Candidate, who passes written examination, shall be allowed a maximum of Three available attempts within 2 years to pass Clinical/Oral examination. However, in case of failure to pass Clinical examination within stipulated attempts the credit of passing the written examination shall stand withdrawn and candidate shall have to take entire examination including written examination, afresh.
- Candidate who has completed his or her training along with all the requirements mentioned in the curriculum shall have to appear in the written of final examination at least once within period of 7 years (from the time of induction in the training). Failure to compliance with this, the matter will be referred to the competent authority through proper channel for final decision.

Synopsis and Thesis Writing:

Thesis writing must be completed and thesis be submitted at least 6 months before the end of final year of the program.

Thesis evaluation & defense will be carried out at the end of 4th calendar year of MD Diagnostic Radiology.

Submission / Evaluation of Synopsis

- a) The candidates shall prepare their synopsis as per guidelines provided by the Advanced Studies & Research Board, available on the university website.

- b) The research topic in clinical subject should have 30% component related to basic sciences and 70% component related to applied clinical sciences. The research topic must consist of a reasonable sample size and sufficient numbers of variables to give training to the candidate to conduct research, to collect & analyze the data.

- c) Synopsis of research project shall be got approved by the end of the 2nd year of MS/MD program. The synopsis after review by an Institutional Review Committee, shall be submitted to the University for consideration by the Advanced Studies & Research Board, through the Principal / Dean /Head of the institution.

Submission and evaluation of Thesis Evaluation (300 Marks)

1. The Thesis shall be submitted to the Controller of Examination through Head of Institute, duly signed by the Supervisor, Co-Supervisor(s) and Head of the Department.
2. Submission of Thesis is a prerequisite for taking Final Theory Examination.
3. Examiners shall be appointed by the Vice chancellor on recommendation of Controller of Examination from a panel approved by Advance Studies & Research Board for evaluation of thesis.
4. MD Diagnostic Radiology thesis shall be evaluated by 2 examiners (1 External and 1 Internal examiners) (The supervisor must not be the evaluator)

Paper scheme

INTERMEDIATE EXAMINATION

100 MCQs each MCQ of 2 marks = 200 marks

10 SEQs each SEQ of 10 marks= 100 marks

Written

Sr. #	TOPICS	No of MCQS	Level	No of SEQs
1.	Medicine	10	C1, C2, C3	1
2.	Surgery	10	C1, C2, C3	
3.	Nuclear medicine	10	C1, C2, C3	1
4.	Interventional and vascular Radiology	10	C1, C2, C3	1
GENERAL RADIOLOGY				
5.	Introduction to Radiation	02	C1, C2, C3	1
6.	X-Ray Production	02	C1, C2, C3	
7.	X-ray interaction	03	C1, C2, C3	1
8.	X-Ray interaction with patient	02	C1, C2, C3	
9.	Image receptor	02	C1, C2, C3	
10.	Scattered rays and quality to assurance	02	C1, C2, C3	
SPECIAL RADIOLOGY				
11.	Physics of USG, CT, MRI	06	C1, C2, C3	1
12.	Radiological Techniques of USG, CT, MRI	04	C1, C2, C3	1
13.	Contrast media and pharmacological aids to radiology	04	C1, C2, C3	1
14.	Radiological Techniques of Contrast media and pharmacological aids and general radiology	03	C1, C2, C3	

Section

RECOMMENDED BOOKS & RESOURCES

1. Ryan S. *Anatomy for Diagnostic Imaging*. II ed. Saunders; 2004.
2. Bushong S. C. *Radiological Science for Technologists Physics, Biology and Protection*. 8th ed. Mosby;2004.
3. Chapman S. and Nakienly R. *A Guide to Radiological Procedures*. 4th ed. Baillier Tindall, Jaypee Brothers; 2001.
4. Bhargava S. K. *Radiological Procedures*. 1st ed. Delhi: Peepee Publishers; 2004.
5. Chapman S. and Nakielny R. *Aids to Radiological Differential Diagnosis*. 4th ed. Elsevier Science Limited; 2003.
6. Holm T. *WHO Basic Radiologic System: Manual of Radiographic Techniques*. Delhi: AITBS Publishers; 2002.
7. Sutton D. *Textbook of Radiology and imaging (Vol. I and II)*.7th ed. UK: Churchill Livingstone; 2003.
8. Clark. *Clark's Textbook of Positioning in Radiology*. 12th ed. Hoddler Arnold Publications; 2005

Section K

List of authors and contributors

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A handwritten signature in black ink, appearing to read 'Hassan Bukhari', with a stylized flourish above it.