
**CURRICULUM
FOR
2 YEARS DIPLOMA PROGRAMME
IN
MEDICAL RADIOLOGICAL DIAGNOSIS
(DMRD)**



**Nishtar Medical University & Hospital
Multan**

SR.	CONTENTS	PAGE NO
1	Foreword	1
2	Aims and Objectives of the Course	3
3	Specific Learning Outcomes	4
3	Nomenclature and Duration	5
4	Eligibility Criteria for Admission	7
5	Recognition/Equivalence Related Issues	8
6	Content Outline	9
8	Methods of Instruction/Course Conduction	17
9	Log Book	19
10	Literature Review	21
11	Examinations	22
12	Recommended Books	27

FOREWORD

Nishtar Medical University Multan, with the vision to explicitly address academic and research needs in the field of health sciences and allied disciplines and to uplift their existing level to bring them on a par with the international standards.

The mission of the University is to develop an intellectual nexus to provide excellence and innovation in medical education and research in order to;

- Impart knowledge and skills to health care providers to enhance their competence in providing community oriented and multi-disciplinary patient-centered care
- Train and produce researchers and specialists in basic and clinical medical sciences
- Establish and maintain continuing professional development programmes for the faculty
- Provide trained professionals and scientists/researchers for the field of Electro Medical/Bio-Medical disciplines
- Assure quality in health education and research at all levels

A university is the zenith of knowledge that imparts quality education and awards degrees for extensive educational attainments in various disciplines with attendant advancement for the development of intellectual community. Protection of traditional knowledge, making exploration about it and obtaining deep understanding of modern technology and research techniques are some of the responsibilities of any university.

NMU is running a number of courses in the field of health sciences in Punjab. The list extends from undergraduate level courses up to the doctorate level both in basic, clinical and allied health sciences.

Since its inception, certain vital tasks were taken into serious consideration by NMU, for instance, curricula development and their up-gradation were among the most important ones besides introduction of contemporary educational programmes.

NMU has revised and finalized curricula for undergraduate Medical/Dental Education, BSc Nursing, and Allied Health Sciences.

In keeping with its commitment for further improvement in the standard of medical education, NMU has taken an initiative to modify

and improve one year postgraduate diploma courses to 2 years structured training programmes.

I do not believe in selling an old product in a new packing with a fresh label on it, just to do the job. Original products with actual outcomes for the society must be guaranteed. Being the Vice Chancellor of a public sector health university, I believe, it is my duty to remain vigilant and committed to the cause of improvement of the conventional medical and allied health sciences' curricula on regular basis. This will help produce technically sound professionals with advanced knowledge and skills.

Presently, NMU has designed and facilitated curriculum development committees for eleven clinical disciplines namely: DTCD, DPM, DMRT, DOMS, DLO, Dip. Card, DCH, DCP, DGO, DMRD and DA.

This document precisely briefs the details of updated curriculum for Diploma in Medical Radiology (DMRD) as prepared by the Experts' Committee.

I am pleased to acknowledge the efforts made by the Department of Medical Education and the members of the committee for DMRD consisting of: *Prof. Dr. Abdul Sattar Anjum* , *Dr. Maham Munir Awan* and *Dr. Samreen Mushtaq*. The contributions made by them will go a long way in the education and training of doctors in this field.

I hope, the revised course will be able to meet the needs of latest trends in Diagnostic Radiology and will certainly produce competent mid-level specialists in the field, which is the main objective of this programme.

Prof. Dr. Rana Altaf Ahmad

Vice Chancellor
Nishtar Medical University, Multan.

AIMS AND OBJECTIVES OF THE COURSE

AIM

The aim of 2 years diploma programme in Medical Radiology is to equip medical graduates with relevant professional knowledge, skills and ethical values to enable them to apply their acquired expertise at primary and secondary health care organizations as non-academic consultants.

OBJECTIVES

At the end of training in DMRD, a trainee doctor should be able to:

1. Take a comprehensive and pertinent history of patients coming for radiological investigations
2. Take proper informed consent before commencing any investigative procedure and ensuring confidentiality and appropriate environment for procedures and investigative processes involving unusual exposure
3. Explain all procedures to patients or to their relatives in patient's preferred language in elective and emergency situations in keeping principles of good communication skills, empathy and empowerment to patients
4. Satisfactorily address fears, concerns and expectations of the patients
5. Exhibit emotional maturity and stability, integrity, ethical values and professional approach, sense of responsibility in day-to-day professional activities
6. Act as an independent specialist at Community/Tehsil and Headquarter Hospital
7. Show initiative and become life long self-directed learners tapping on resources including clinical material, faculty, internet and on-line learning programmes and library

SPECIFIC LEARNING OUTCOMES

Following competencies will be expected from a student completing 2 years' course in DMRD, student should be able to:

1. Interpret common radiological findings in a scientific manner while keeping in mind the logical reasoning and a clear understanding of their impact on human mind and body
2. Perform recommended conventional radiological procedures with expertise
3. Perform upper abdominal, upper abdominal/kidney, female/male pelvic and obstetrical ultrasound
4. Identify common pathologies occurring in the upper abdomen, pelvis (male & female) on ultrasound
5. Facilitate various ultrasound guided and CT guided procedures
6. Interpret Computed Tomography (CT) results
7. Decide when to use and not to use contrast in CT
8. Interpret Magnetic Resonance Imaging results
9. Manage anaphylactic shock may result due to any contrast media

NOMENCLATURE AND DURATION

NOMENCLATURE OF THE PROPOSED COURSE:

The name of diploma course should be retained as DMRD. This name has been recognized and established for the last many decades worldwide. The duration of courses should be two years structured training in a recognized department under an approved supervisor.

Course Title: DMRD (Diploma in Medical and Diagnostic Radiology)

Training Centres: Departments of Radiology (accredited by NMU) in affiliated institutes of the University of Health Sciences Lahore

Course Duration and Scheme of the Course:

Total Duration 2 years structured training (9 months in Part I and 15 months in Part II) in a recognized department under the guidance of an approved supervisor

Part I-09 MONTHS

Theoretical Component

- Physics
- Applied Anatomy
- General Pathology
- Behavioral Sciences
- Biostatistics and Research

Practical Component

- Physics Related Experiments

Part II- 15 MONTHS

Theoretical Component

- Plain X-Rays
- Contrast Studies

- Sonography
- Mammography
- Angiography
- Scintigraphy
- Computed Tomography
- Magnetic Resonance Imaging

Clinical Component

- Regular duties to learn diagnostic imaging techniques
- Regular indoor, outdoor and emergency duties in x-ray, ultrasound and CT & MRI

ELIGIBILITY CRITERIA FOR ADMISSION

DOCUMENTS REQUIRED FOR THE ADMISSION

1. Completed DMRD application form
2. Copy of MBBS degree with mark sheets of professional examinations and certificate of number of attempts in the professional examinations
3. Copy of PMDC registration certificate
4. Three latest passport size photographs
5. Reference letters from two consultants, with whom the applicant has worked
6. Certificates of completion of required experience

GENERAL REQUIREMENTS

Candidates eligible for admission should have MBBS or equivalent qualification, registered with PMDC and can fulfill one of the following criteria:

One year House Job from a recognized institution

SPECIAL REQUIREMENTS

1. Obtaining pass percentage in the entry test as determined by the NMU Multan rules
2. Having up to the mark credentials as determined by the NMU rules (no. of attempts in each professional, any gold medals or distinctions, relevant work experience, research experience from a recognized institution, any research article published in a National or an International Journal)

REGISTRATION AND ENROLLMENT

- NMU Multan will approve supervisors for diploma courses
- Candidates selected for the courses will be registered with relevant supervisors and enrolled at NMU

RECOGNITION/EQUIVALENCE OF THE DEGREE AND INSTITUTION

After two years training course, candidate should be given status of mid-level specialist equivalent to any other similar qualification.

ACCREDITATION RELATED ISSUES OF THE INSTITUTION:

1. Faculty

Properly qualified teaching staff in accordance with the requirements of Pakistan Medical Commission **(PMC)**

2. Adequate Space

Including class-rooms (with audiovisual aids), computer lab, X-ray plant, Fluoroscopy, latest ultrasound / Doppler machines, CT & MRI plant.

3. Library

Departmental library should have latest editions of recommended books for DMRD, reference books and latest journals (two National and one International)

CONTENT OUTLINE

Part I DMRD

APPLIED ANATOMY

1. Upper and Lower Limbs
2. Thorax
3. Abdomen & Pelvis
4. Head & Neck
5. Neuro Anatomy

GENERAL PATHOLOGY

Cell Injury and adaptation

Cell Injury

- Reversible and Irreversible Injury
- Fatty change, Pigmentation, Pathologic calcification
- Necrosis and Gangrene

Cellular adaptation

- Atrophy, Hypertrophy,
- Hyperplasia, Metaplasia, Aplasia

Inflammation

- **Acute inflammation** --- Vascular changes, Chemotaxis, Opsonization and Phagocytosis
- Enlist the cellular components and chemical mediators of acute inflammation
- Differentiate between exudates and transudate

- **Chronic inflammation**

- Etiological factors, Granuloma

Cell repair and wound healing

- Regeneration and Repair
- Healing--- steps of wound healing by first and second intention
- Factors affecting healing
- Enlist the complications of wound healing

Haemodynamic disorders

- Define and classify the terms Edema, Haemorrhage, Thrombosis, Embolism, Infarction & Hyperaemia
- Define and classify Shock with causes of each.
- Describe the compensatory mechanisms involved in shock
- Describe the pathogenesis and possible consequences of thrombosis
- Describe the difference between arterial and venous emboli

Neoplasia

- Dysplasia and Neoplasia
- Differences between benign and malignant neoplasms
- Enlist the common etiological factors for neoplasia
- Define and discuss the different modes of metastasis
- TNM staging system and tumor grade

Immunity and Hypersensitivity

Urinary system: Effect of injury and disease

PHYSICS

Production and Properties of X-Rays

1. The Roentgen tube
2. General properties
3. Diffraction of Roentgen rays by crystals.
4. Roentgen spectrum
5. Characteristics radiation
6. Absorption of Roentgen rays
7. Reflection and refraction
8. Secondary rays:
 - a. Scattered radiation, Compton effect
 - b. Characteristic radiation
 - c. Corpuscular rays
9. Production of ionization

Quality measurements:

- Biological methods
- Thermal methods
- Ionisation method
- Chemical methods
- Fluorescence

RADIATION PROTECTION

RADIO BIOLOGY

BASIC PHYSICS OF ULTRASOUND, CT & MRI

BEHAVIOURAL SCIENCES

- a. Bio-Psycho-Social (BPS) Model of Health Care
- b. Use of Non-medicinal Interventions in Clinical Practice
 - Communication Skills
 - Counseling
 - Informational Skills
- c. Crisis Intervention/Disaster Management
- d. Conflict Resolution
- e. Breaking Bad News
- f. Medical Ethics, Professionalism and Doctor-Patient Relationship
 - Hippocratic Oath

- Four Pillars of Medical Ethics (Autonomy, Beneficence, Non-maleficence and Justice)
 - Informed Consent and Confidentiality
 - Ethical Dilemmas in a Doctor's Life
- g. Delivery of Culturally Relevant Care and Cultural Sensitivity
 - h. Psychological Aspects of Health and Disease
 - Psychological Aspect of Health
 - Psychological Aspect of Disease
 - Stress and its Management
 - Psychological Aspect of Pain
 - Psychological Aspect of Aging

BIOSTATISTICS AND RESEARCH

- a. Introduction to Bio-Statistics
- b. Introduction to Bio- Medical Research
- c. Why research is important?
- d. What research to do?
 - Selecting a Field for Research
 - Drivers for Health Research
 - Participation in National and International Research
 - Participation in Pharmaceutical Company Research
 - Where do research ideas come from
 - Criteria for a good research topic
- e. Ethics in Health Research
- f. Writing a Scientific Paper
- g. Making a Scientific Presentation
- h. Searching the Literature

Part II DMRD

- Plain X-Rays
- Mammography
- Contrast Studies
- Sonography
 - Abdomen
 - Pelvis
 - Gynae \ Obstetrics \ TVS
 - Small parts

- Thyroid Gland
 - Breast
 - Neonatal Hip
 - Scrotum
- Doppler Studies
 - Peripheral
 - Renal
 - Portovenous
 - Cerebral
- Basic USG Guided Interventions (Pleural & ascitic tap, drainage of abscess / collection, FNAC, Biopsy)
- Computed Tomography (CT)
 - Brain
 - Head & Neck
 - Chest
 - Abdomen
 - Pelvis
 - MSK Including Spine & rest of the skeleton
 - Angiography
 - Cerebral
 - Peripheral
 - Pulmonary
 - Abdominal
 - Cardiac
- Magnetic Resonance Imaging (MRI)
 - Brain
 - Whole Spine
 - Abdomen
 - Pelvis
 - MSK including all joints
 - Angiography
 - Cerebral
 - Peripheral
 - Abdominal
 - Cardiac
- Scintigraphy
 - Bone Scan
 - Thyroid Gland Scan
 - HIDA Scan
 - Renal Scan
- 15 days rotation each in medicine and surgery departments in 1-^{1/2} years duration.

METHODS OF INSTRUCTION/COURSE CONDUCTION

As a policy, active participation of students at all levels will be encouraged.

Following teaching modalities will be employed:

1. Lectures
2. Seminar Presentation and Journal Club Presentations
3. Group Discussions
4. Grand Rounds
5. SEQ as assignments on the content areas
6. Hands-on training experience in diagnostic Imaging Techniques
7. Diagnostic Imaging Techniques training workshops
8. Indoor and outdoor clinics
9. Long and short case presentations

In addition to the conventional teaching methodologies following interactive strategies will also be introduced to improve both communication and clinical skills in the upcoming consultants:

Monthly Student Meetings

Each affiliated medical college approved to conduct training for DMRD will provide a room for student meetings/discussions such as

- a. Journal Club Meeting
- b. Core Curriculum Meetings
- c. Skill Development

a. Journal Club Meeting

Two hours per month should be allocated to the presentation and discussion of a recent Journal article related to Radiology. The article should be critically evaluated and its applicable results should be highlighted which can be incorporated in clinical practice. Record of all such articles should be maintained in the relevant department of each medical college. Students of different medical colleges may be given an opportunity to share all such interesting articles with each other.

b. Core Curriculum Meetings

All the core topics of DMRD should be thoroughly discussed during these sessions. The duration of each session should be at least two hours once a month. It should be chaired by the chief student (elected by the students of the relevant diploma). Each student should be given an opportunity to brainstorm all topics included in the course and to

generate new ideas regarding the improvement of the course structure.

c. Skill Development

Two hours twice a month should be assigned for learning and practicing clinical skills.

List of skills to be learnt during these sessions is as follows:

- 1.** Communication skills
- 2.** Interpretation of various radiological findings
- 3.** Practical skills i.e, diagnostic imaging techniques
- 4.** Presentation skills: Power point, lectures, small group discussions, article presentation etc.
- 5.** Research and scientific writing
- 6.** For acquisition of procedural skills like conventional radiographic procedures like Retrograde Urographic Studies, Barium Swallow, Barium Meal, Barium Enema, Mammography, Lymphography, Hysterosalpingography, Scintigraphy, Ultrasound guided procedures, CT with and without contrast and interpretation of MRI, opportunities during postings should be availed

Annual Grand Meeting

Once a year all students enrolled for DMRD should be invited to the annual meeting at NMU Multan.

One full day will be allocated to this event. All the chief students will present their annual reports. Issues and concerns related to their relevant diploma courses will be discussed. Feedback may be collected and also suggestions can be sought in order to involve students in decision making. The research work and their literary work may also be displayed.

In the evening an informal get together and dinner should be arranged. This will help in creating a sense of belonging and ownership among students and the faculty.

LOG BOOK

The trainees must maintain a log book and get it signed regularly by the supervisor. A complete and duly certified log book should be part of the requirement to sit for the DMRD examination. Log book should include adequate number of diagnostic procedures, routine and emergency management of patients, case presentations in CPCs, journal club meetings and literature review.

Proposed Format of Log Book is as follows:

Candidate's Name: _____
Roll No. _____

PROCEDURES:

1. Plain x-rays
2. Barium Swallow
3. Barium Meal
4. Barium Enema
5. Retrograde Urography
6. Hysterosalpingography
7. Mammography
8. Conventional Sonography
9. Ultrasound guided procedures
10. CT Scan
11. CT guided Procedures
12. MRI

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure Performed	Supervisor's Signature
1					
2					

Case Presented

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Case Presented	Supervisor's Signature
1				
2				

Seminar/Journal Club Presentation

Sr.#	Date	Topic	Supervisor's signature
1			
2			

Evaluation Record

(Excellent, Good, Adequate, Inadequate, Poor)

Sr.#	Date	Method of Evaluation (Oral, Practical, Theory)	Rating	Supervisor's Signature
1				
2				

EXAMINATIONS

Assessment

It will consist of action and professional growth oriented ***student-centered integrated assessment*** with an additional component of ***informal internal assessment, formative assessment*** and measurement-based ***summative assessment***.

Student-Centered Integrated Assessment

It views students as decision-makers in need of information about their own performance. Integrated Assessment is meant to give students responsibility for deciding what to evaluate, as well as how to evaluate it, encourages students to '**own**' the evaluation and to use it as a basis for self-improvement. Therefore, it tends to be growth-oriented, student-controlled, collaborative, dynamic, contextualized, informal, flexible and action-oriented.

In the proposed curriculum, it will be based on:

- Self Assessment by the student
- Peer Assessment
- Informal Internal Assessment by the Faculty

Self Assessment by the Student

Each student will be provided with a pre-designed self-assessment form to evaluate his/her level of comfort and competency in dealing with different relevant clinical situations. It will be the responsibility of the student to correctly identify his/her areas of weakness and to take appropriate measures to address those weaknesses.

Peer Assessment

The students will also be expected to evaluate their peers after the monthly small group meeting. These should be followed by a constructive feedback according to the prescribed guidelines and should be non-judgmental in nature. This will enable students to become good mentors in future.

Informal Internal Assessment by the Faculty

There will be no formal allocation of marks for the component of Internal Assessment so that students are willing to confront their weaknesses rather than hiding them from their instructors.

It will include:

- a. Punctuality
- b. Work during different postings
- c. Monthly assessment (written tests to indicate particular areas of weaknesses)
- d. Participation in interactive sessions

Formative Assessment

Will help to improve the existing instructional methods and the curriculum in use

Feedback to the faculty by the students:

After every three months students will be providing a written feedback regarding their course components and teaching methods. This will help to identify strengths and weaknesses of the relevant course, faculty members and to ascertain areas for further improvement.

Summative Assessment

It will be carried out at the end of the programme to empirically evaluate **cognitive, psychomotor** and **affective domains** in order to award diplomas for successful completion of courses.

Eligibility to Appear in Final Examination

- Only those candidates will be eligible to take final examination, who have passed Part 1 examination (after 6 months of education) and have completed two years of structured/supervised training programme.
- Students who have completed their log books and hold certificates of 75% attendance may be allowed to sit for the exam
- The application for the final examination will be forwarded with recommendations of the supervisor
- One research article
- Three mandatory workshops (in first 6 months):
 - Research methodology
 - Communications skills
 - BLS
- 15 days rotation each in medicine and surgery departments in 1-^{1/2} years duration.

- Only those candidates who qualify in theory will be called for clinical examination

DMRD Examination

Part I DMRD

Topics included in paper 1

- | | |
|-------------------------------|-----------|
| 1. Physics | (25 MCQs) |
| 2. Applied Anatomy | (30 MCQs) |
| 3. Pathology | (30 MCQs) |
| 4. Behavioral Sciences | (10 MCQs) |
| 5. Biostatistics and Research | (05 MCQs) |

Components of the Part 1 examination

MCQ Paper	100 One Best Type
Total Marks	100 Marks

Part II DMRD

Topics included in paper 1

- Chest & Cardiovascular System
- Central Nervous System & Head And Neck
- Women Imaging-Breast

Topics included in paper 2

- Musculoskeletal System
- GIT & Biliary System
- Genito Urinary System
- Nuclear Medicine
- Pediatric

Part II Examination

Theory

Paper I

10 SEQs (No Choice)
50 MCQs

100 Marks

50 Marks
50 Marks

3 Hours

Paper II

10 SEQs (No Choice)
50 MCQs

100 Marks

50 Marks
50 Marks

3 Hours

The candidates who pass in theory papers, will be eligible to appear in the clinical & viva voce.

OSCE

80 Marks

10 stations each carrying 8 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

Log Book

20 Marks

Viva

100 Marks

Two stations, four examiners, five cases per examiner, 25 marks to each examiner.

Components of the Part II examination

Theory paper 1	100 marks
Theory paper 2	100 marks
Osce + Viva	180 marks
Internal Assessment/Log Book	20 marks
Total Marks	400

A panel of four examiners from affiliated Radiology departments (Two internal and two external) will be appointed for practical examination.

Each component of practical examination will be assessed by two examiners awarding marks simultaneously and independently. The final score awarded will be an average score, as agreed by both examiners.

Pass Percentage and Other Regulations Regarding Examination

- Criterion referenced assessment principles will be used
- 20 marks for the log book will be included in the OSCE component
- 60% marks will be a pass score in each component
- Candidates failing in any one component will have to re-sit the entire examination
- A maximum of 5 attempts to sit for the examination will be allowed, to be availed within 3 calendar years of the first attempt
- Re-admission in DMRD course is not permissible under any circumstances
- The results will be announced according to rules and regulations set by the Examination Branch of Nishtar Medical University, Multan.

RECOMMENDED BOOKS

1. Ryan S. ***Anatomy for Diagnostic Imaging.***
2. Bushong S. C. ***Radiological Science for Technologists Physics, Biology and Protection.***
3. Chapman S. and Nakienly R. ***A Guide to Radiological Procedures.***
4. William E. Brant & Clyde A. Helms ***Fundamentals of Diagnostic Radiology***
5. Bhargava S. K. ***Radiological Procedures.***
6. Chapman S. and Nakielny R. ***Aids to Radiological Differential Diagnosis.***
7. Holm T. ***WHO Basic Radiologic System: Manual of Radiographic Techniques.***
8. Sutton D. ***Textbook of Radiology and imaging***
9. Clark. ***Clark's Textbook of Positioning in Radiology.***
10. Rana M. H., Ali S. Mustafa M. ***A Handnook of Behavioural Sciences for Medical and Dental Students.*** Lahore: University of Health Science; 2007.
11. Fathalla M. F. and Fathalla M. M. F. ***A Practical Guide for Health Researcher.*** Cairo: World Health Organization; 2004.