Syllabus and Curriculum
of
Diploma in X-Ray Technician course

(To be implemented From 2015 - 16 session)

Uttar Pradesh State Medical Faculty, Lucknow.

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OBJECTIVES OF THE COURSE

To prepare a **X-Ray technician** who –

- Can perform X-rays of all parts precisely.
- Is able to develope film.
- Can administer contrast & is able to handle adverse reactions to it.
- Is well aware of Radiation Gazards & protection measures.
- Can read basics of various X-rays.

Outline of Curriculum of Diploma in X-Ray Technician course

FIRST YEAR

THEORY (Classes: 9 AM to 12 Noon)

First paper : **Syllabus covers** -
1. General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body). 2. Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing X-ray.

Second paper : **Syllabus covers** -
1. Details of radiological Anatomy & surface making. 2. Radiophysics, Radiographic positions & Radiation hazards. 3. Hand hygiene & prevention of cross infection. 4. Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).

FIRST YEAR

PRACTICAL (Classes: 1 PM to 4 PM)

Practical classes will be after lunch; from 1 PM to 4 PM.

Students must present in the hospital/X-ray unit for practicals.

During first year, they should be there only as "Observers" in practical classes.

Following subjects must be taught; though there will not be any exam from these-
1. Basic Computer skills. 2. Basic English. 2. **Soft skills like** - Interpersonal relationship skills & moral education. .

Outline of Curriculum
of
Diploma in X-Ray Technician course

SECOND YEAR

THEORY (claases:9 AM to 12 Noon)

First paper : **Syllabus cover**s -
1. Details of Only relevant surgical & medical conditions. 2. Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.

Second paper : **Syllabus cover**s -
1. Radiological imaging techniques & patient care. 2. Bio-medical physics of X-ray machine & developement of X-ray film etc.

SECOND YEAR

PRACTICAL (claases:9 AM to 12 Noon)

Practical exams syllabus should cover-

Hands on training of :-

- Preparation of patient for X-ray.
- Performing all types of X-ray.
- Contrast administration & management of adverse reactions to it.
- Protection from radiation hazards.
- Developing film.
- Record keeping.

ELIGIBILITY CRITERIA FOR ADMISSION & DURATION OF THE COURSE

COURSE DURATION:-

- It is 2 years, **full time** Diploma Course.

ELIGIBITY:-

- Candidate must have passed 12th with

  Physics, Chemistry, Biology

  Or

  Physics, Chemistry, Maths

  with 35% marks in Intermediate exams.

  (From UP board or any other recognised board).

- Candidate must have completed age of 17 years of age as on 31st December of admission year. There is no maximum age limit for the admission.

SCHEDULE OF EXAMINATION

FIRST YEAR

Paper	Subjects	Mark	Internal Assessment Marks	Total Marks	Pass Marks	Duration of Exam.
First Paper Theory	1.General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body). 2.Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing X-ray.	75	25	100	50	3 Hours
Second Paper Theory	1.Details of radiological Anatomy & surface making. 2.Radiophysics, Radiographic positions & Radiation hazards. 3.Hand hygiene & prevention of cross infection. 4.Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR	75	25	100	50	3 Hours
Practical	Oral & Practical	75	25	100	50	3 Hours

SCHEDULE OF EXAMINATION

SECOND YEAR

Paper	Subjects	Mark	Internal Assessment Marks	Total Marks	Pass Marks	Duration of Exam.
First Paper Theory	1.Details of Only relevant surgical & medical conditions. 2.Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.	75	25	100	50	3 Hours
Second Paper Theory	1.Radiological imaging techniques & patient care. 2. Bio-medical physics of X-ray machine & developement of X-ray film etc. .	75	25	100	50	3 Hours
Practical	Oral & Practical	75	25	100	50	3 Hours

SCHEDULE OF COURSE

(List of holidays, Total hours, Subject wise allottement of hours)

- **List of Holidays:-**

Sundays	- 52 days
Summer vacation	- 10 days
Winter vacation	- 10 days
Gazetted holidays	- 23 days
Preparatory holidays	- 10 days
Total Holidays	- 105 days

- **Total Hours :-**

Theory classes per day	- 3 Hours
Practical classes per day	- 3 Hours
Total hours per day	- 6 Hours
Total days & hours in One year (after deduction of holidays)	- 260 days or - 1560 Hours

SCHEDULE OF COURSE

Subject wise allottement of hours

FIRST YEAR

Theory (780 Hours) Practical (780 Hours)

First Paper Theory	1.General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body).	200 Hrs
	2.Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing X-ray. .	100 Hrs
Second Paper Theory	1.Details of radiological Anatomy & surface making.	100 Hrs
	2.Radiophysics, Radiographic positions & Radiation hazards.	240 Hrs
	3.Hand hygiene & prevention of cross infection.	30 Hrs
	4.Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).	40 Hrs
Third Paper Practical	As described in curriculum	780 Hrs
Theory: Other Subjects (These subjects must be taught; though there will not be any exam from these)	1.Basic Computer skills.	30 Hrs
	2.Basic English.	30 Hrs
	3.Soft skills like - Interpersonal relationship skills & moral education	10 Hrs

SCHEDULE OF COURSE

Subject wise allottement of hours

SECOND YEAR

Theory (780 Hours) Practical (780 Hours)

First Paper Theory	1.Details of Only relevant surgical & medical conditions.	350 Hrs
	2.Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.	20 Hrs
Second Paper Theory	1.Radiological imaging techniques & patient care.	330 Hrs
	2.Bio-medical physics of X-ray machine & developement of X-ray film etc.	80 Hrs
Third Paper Practical	As described in curriculum	780 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 1st Theory	Topics	Hours.
1.**General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body).**	**1.** General Orientation about parts of human body. Various terms used in Anatomy. Total numbers of bones, their names & location. Basic idea about organzation of body ,from cell to organ systems.	10 Hrs
	2. Structure of Animal cell, Cell organelles & their functions	05 Hrs
	3. Human tissue, types, structure & functions.	10 Hrs
	4. Osteology: Names, location, identification and basic details of all bones.	10 Hrs
	5. Joints: types, basic structure & examples.	15 Hrs
	6. Skin & appendages.	02 Hrs
	7. GIT: : Location, Gross structure, various parts & their functions.	20 Hrs
	8. Respiratory tract: Location, Gross structure, various parts & their functions.	20 Hrs
	9. Urinary tract: Gross structure, various parts & their functions. (Microscopic structure is not required.)	10 Hrs
	10. Male reproductive system: Only gross structure & functions of different parts. (Microscopic structure is not required.)	05 Hrs
	11. Female reproductive system: Only gross structure & functions of different parts. (Microscopic structure is not required.)	05 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 1st Theory	Topics	Hours.
1.**General Anatomy & Physiology (Cytology, Histology, Osteology and basics of all organ systems of body).**	**12.** Endocrine system: Hormones secreted by Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal cortex, Adrenal medulla, Gonads & functions of different hormones. (Details of structure of these glands not required).	10 Hrs
	13. Details of Gross structure of brain & spinal cord. Functions of different parts of brain & spinal cord.	20 Hrs
	14. Blood: Composition & Functions. Details about Plasma, RBCs, WBCs, Platelets, Clotting system.	20 Hrs
	15. Gross structure & functions of sensory Organs - Eye, Ear, Nose, Tongue.(Details not required).	10 Hrs
	16. Basic gross structure of heart, vessels opening into heart & Leaving the heart. Arterial & Venous tree of body.	20 Hrs
	17. Lymphatic system: Structure & Functions.	05 Hrs
	18. Inumune system: Components & various mechanisms of defense.	05 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 1st Theory	Topics	Hours.
2.Only basics of relevant Pathology, Pharmacology & Microbiology & drugs used duing X-ray Scan.	1. Basic steps of Acute & chronic inflammation.	05 Hrs
	2. Basics of Necrosis & apoptosis.	02 Hrs
	3. Basics of Shock.	02 Hrs
	4. Basics of Disorders of blood coagulation system.	04 Hrs
	5. Basics of Disorders of Immune system of body.	05 Hrs
	6. Modes of disease transmission & prevention of infection.	05 Hrs
	7. Sterilization & methods of sterilization used in hospitals.	10 Hrs
	8. Basic idea about types of Bacteria, Virus, Fumgi.	15 Hrs
	9. Rouths of drug administration.	02 Hrs
	10. Adverse effects & side effects of drugs.	02 Hrs
	11. Basic idea of Analgesics : Opioid & NSAIDs.	02 Hrs
	12. Basic idea of Drugs use in Cough & expectoration.	01 Hrs
	13. Basic idea of Drugs used in B.asthma & COPD.	02 Hrs
	14. Basic idea of Drugs used in GIT.	08 Hrs
	15. Basic idea of Anti Microbials.	20 Hrs
	16. Basic idea of Anti H-1 Histaminics & Corticosteroids.	02 Hrs
	17. Contrasts & drugs used in radiography.	15 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 2nd Theory	Topics	Hours.
1 .**Details of radiological Anatomy & surface making.**	1. Radiological and surface Anatomy of Skull.	15 Hrs
	2. Radiological and surface Anatomy of Vertebral colomn.	05 Hrs
	3. Radiological and surface Anatomy of Ribs & sternum.	05 Hrs
	4. Radiological and surface Anatomy of Upper limb.	10 Hrs
	5. Radiological and surface Anatomy of Lower limb.	10 Hrs
	6. Radiological and surface Anatomy of Abdomen.	15 Hrs
	7. Radiological and surface Anatomy of Thorax.	15 Hrs
	8. Radiological and surface Anatomy of Breast.	05 Hrs
	9. Radiological and surface Anatomy of Para nasal sinuses.	05 Hrs
	10. Radiological and surface Anatomy of maxillo-facial region.	05 Hrs
	11. Radiological and surface Anatomy of various joints of body.	10 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 2nd Theory	Topics	Hours.
2.Radiophysics, Radiographic positions & Radiation hazards.	**INTRODUCTION TO Physics**	
	1. Radiologic Physics,Electromagnetic radiation,Neil's Bohr Atomic model,Atomic number,Mass number,Isotopes, Valency.	07 Hrs
	2. Ionization.	03 Hrs
	3. Principles of thermionic emission and rectification in x-ray technology. High voltage circuits in x-ray Units. Effects of variation of tube voltage, current, filtration, HT waveform and target material on X-ray production.	10 Hrs
	4. Attenuation, absorption and scattering phenomenon. Photoelectric absorption, Compton scattering, pair production and annihilation process.	05 Hrs
	5. X-Ray Physics,Discovery of X-Ray, Roentgenology, Fluroscopy,Nature of X-Ray,Wave length and Frequency Sources of X-Ray,X-Ray Tube & X- ray control panel X ray circuit.	15 Hrs
	6. Necessary Conditions for the production of X-Ray.	02 Hrs
	7. Efficiency of X-Ray Production, properties of X-Ray, Quality and Quantity of X-Ray.	03 Hrs
	8. Transmission of X-ray through body tissues. Linear energy transfer. Range of secondary electrons and electrons build up. Relative amounts of scatter from homogeneous and heterogeneous beam during the passage through a patient.	05 Hrs
	9. Exponential and trigonometric functions used in radiological calculations.	05 Hrs
	10. Physical requirement of beam defining devices e.g. cones, diaphragm, collimators etc	05 Hrs
	11. Units of radiation measurements.	05 Hrs
	12. Specification of quality and half-valve thickness (HVT) and its measurements	05 Hrs
	13. Filters and filtration.	05 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 2nd Theory	Topics	Hours.
2.Radiophysics, Radiographic positions & Radiation hazards.	14. Measurement of radiation and dosimeteric procedures. Radiation detectors and their principles of working. Physical properties of phantoms, phantom materials.	10 Hrs
	15. Details of X-ray machines.	25 Hrs
	16. Detection and measurement of Ionizing/radiation: Field survey instrument, GM survey instruments, personnel Monitoring devices film badge, TLD, pocket dosimeter, pulsed optically stimulated Luminerce dosimeter (POSL) etc.	10 Hrs
	17. Protection of Personnel - Principles of personnel exposure. reduction - Time, distance, shielding, protective barriers, protective devices.	05 Hrs
	18. Protection of the patient Beam limitation, technique selection, general shielding, grids, image receptors, projection, repeat radiography etc.	05 Hrs
	19. Radiation exposure and pregnancy - ALARA and Pregnancy, the pregnant. radiation worker, patient and radiation exposure standards.	05 Hrs
	20. Film materials in X-ray departments, history, structure of an xray film, single and double emulsion films, types of films, cross over effect.	15 Hrs
	21. Spectral sensitivity of film material, graininess of film material, speed and contrast of photographic materials.	10 Hrs
	22. Sensitometry: Photographic density, characteristic curves, features of the characteristic curve.Variation in the characteristic curve with the development. Comparison of emulsions by their characteristic curves. Information from the characteristic curve.	10 Hrs
	23. The storage of film materials and radiograph; Storage of unprocessed films, storing of radiographs - expiry date, shelflife, storage condition, stock control.	05 Hrs

PAPER 2nd Theory	Topics	Hours.
2.Radiophysics, Radiographic positions & Radiation hazards.	24. Intensifying screens and cassettes. Luminescence: fluorescence and phosphorescence. Construction of an intensifying screen.The fluorescent materials. Types of intensifying screens, intensification factor. The influence of KV, scattered radiation. Detail, sharpness and speed, size of the crystals, reciprocity failure, quantum mottle	15 Hrs
	25. Cassette design, care of cassettes, types of cassettes, mounting of intensifying screens, loading and unloading of cassettes	05 Hrs
	26. Film processing: Development. The nature of development-manual or automatic. The PH scale. The constitution of developing solutions both in manual and automatic processing and properties of developing chemicals. The development time, factors in the use of a developer, developer activity. Film processing: Fixing and role of a fixing solution. Constitution of the fixing solutions and properties of the constituents. Fixer used in automatic processors. Factors affecting the use of the fixer. Regeneration of fixing solution. Silver recovery from waste fixer or from scrap film and its various methods. Rinsing, washing and drying. Objects of rinsing and washing, methods employed. Methods of drying films. Preparation of solutions and making stock solution.	25 Hrs
	27. Dark Room: Layout and planning. Dark room construction Nature of floor,walls, ceiling and radiation protection. Type of entry, door design. Dark room illuminations - white light and safe lighting Dark room equipment and its layout. Location of pass through boxes or cassette hatches. Systems for daylight film handling. Daylight systems using cassettes and without cassettes.	10 Hrs
	28. Viewing accessories: Viewing boxes, magnifiers, viewing conditions.	05 Hrs
	29. Barium Studies.	05 Hrs
	30. IVP	05 Hrs
	31. MCU/RGU/ T tube cholangiogram / HSG.	02 Hrs
	32. Sinogram.	02 Hrs

Details of Curriculum for First Year Diploma in X-Ray Technician

PAPER 2nd Theory	Topics	Hours.
3.Hand hygiene & prevention of cross infection.	1. Hand hygiene & method of Hand washing.	15 Hrs
	2. Prevention of cross infection.	15 Hrs

PAPER 2nd Theory	Topics	Hours.
4.Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).	1. Code blue.	05 Hrs
	2. Details of basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).	35 Hrs

Curriculum
for
Practical :- First Year
Diploma in X-Ray Technician

	Topics
Practical	**Observership for :-**
	1. Preparation of patient for X-ray.
	2. Performing all types of X-rays.
	3. Contrast administration & management of adverse reactions to it.
	4. Protection from radiation hazards.
	5. Performing contrast X rays.
	6. Developing film.
	7. Record keeping.

Details of Curriculum for Second Year Diploma in X-Ray Technician

PAPER 1st Theory	Topics	Hours.
1 .**Details of Only relevant surgical & medical conditions.**	1. History taking. General examination of the patient. Filling Case-sheet. Common clinical words.	15 Hrs
	2. Hypertension:- Def, Causes, Pathology, Clinical fectures, Investigation & Management.	05 Hrs
	3. Hypotension :- Def, Causes, Pathology, Clinical fectures, Investigation & Management.	02 Hrs
	4. Diabetes mellitus :- Def, Causes, Pathology, Clinical fectures, Investigation & Management.	10 Hrs
	5. Diseases of blood :- Anaemia, Basics of coagulation Bleeding disorders & Haemophilia.	20 Hrs
	6. Respiratory Tract :- Pneumonia, Tuberculosis, B.asthma, COPD, Bronchiectasis, Collapse of lung, Pneumonitis, Pleural effusion, Pneumothorax, Empyema thoracis, Cancer lung.	30 Hrs
	7. Diseases of GIT & Liver & GB :-Reflux Oesophagitis, Peptic ulecrs, Gastritis, Instestinal Obstruction, Hepatitis, Cirrhosis of liver, Cholecystitis, appendicitis, Hernia, Piles, Fissure, Fistula, Pancreatitis, Pancreatic Cancer.	60 Hrs
	8. Diseases of Nervous system:- Stroke, Meningo-encephalitis, Glasgow coma scale, Epilepsy, Head Injury.	30 Hrs
	9. Diseases of Urinary tract:- Urolithiasis, Benign prostatic hyperplasia, Hydrocoele, Cancer prostate, urethral stricture, Hypo & epi-spadias.	40 Hrs
	10. Endocrine system :- Diabetes mellitus, hypo & Hyper thyroidism.	10 Hrs
	11. Miscellaneous:- Hypo & Hyper Natraemia, Hypo & Hyper Kalaemia, Hypo & Hyper Calcaemia.	10 Hrs
	12. Infections diseases :- TB, Typhoid, Malaria, Dengue fever, Leprosy, AIDS, Amoebiasis.	30 Hrs

1.Details of Only relevant surgical & medical conditions.	13. Head injury & Intra-cranial bleed.	20 Hrs
	14. D's of G & O: Caesarian section, fibroid uterus, Cancer uterus, prolapse uterus, PID.	20 Hrs
	15. Basics about fracture & management.	20 Hrs
	16. PIVD,Potts spine.	10 Hrs
	17. Oral cavity tumors.	10 Hrs
	18. ENT:. CSOM, ASOM, Laryngeal tumor, Nasal poyp, DNS, Sinusitis.	10 Hrs

PAPER 1st Theory	Topics	Hours.
2.Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion	1. Temperature monitoring & Fever.	02 Hrs
	2. Pulse monitoring.	02 Hrs
	3. BP monitoring.	02 Hrs
	4. Respiration monitoring.	01 Hrs
	5. Types of Injection routes.	01 Hrs
	6. IM Injection.	01 Hrs
	7. IV Injection.	01Hrs
	8. SC Injection.	01 Hrs
	9. Oxygen Therapy.	03 Hrs
	10. Nebulization	03 Hrs
	11. IV Infusion (Also with infusion pump).	01 Hrs
	12. Care of Unconscious patient.	02 Hrs

Details of Curriculum for Second Year Diploma in X-Ray Technician

PAPER 2nd Theory	Topics	Hours.
1.**Radiological imaging techniques & patient care.**	1. Concepts of Radiographic Positioning.	20 Hrs
	2. Positioning & Procedure of X-ray of Scaphoid & hand.	05 Hrs
	3. Positioning & Procedure of X-ray of Elbow & shoulder joint.	15 Hrs
	4. Positioning & Procedure of X-ray of Foot AP & oblique.	15 Hrs
	5. Positioning & Procedure of X-ray of Hip & Knee joint AP.	15 Hrs
	6. Positioning & Procedure of X-ray of Pelvis AP.	15 Hrs
	7. Positioning & Procedure of X-ray of Chest AP, PA & Lat.	15 Hrs
	8. Positioning & Procedure of X-ray of Sub Mento vertical & PNS.	10 Hrs
	9. Positioning & Procedure of X-ray of Skull and Towne's.	15 Hrs
	10. Positioning & Procedure of X-ray of Abdomen Erect.	15 Hrs
	11. Positioning & Procedure of X-ray of Barium Studies.	10 Hrs
	12. Positioning & Procedure of X-ray of IVP	10 Hrs
	13. Positioning & Procedure of X-ray of MCU/RGU/ T tube cholangiogram/ HSG.	10 Hrs
	14. Positioning & Procedure of X-ray of Sinogram.	10 Hrs
	15. Dental Radiography: Radiography of teeth-intra oral, extraoral and Occlusal view.	10 Hrs
	16. Macroradiography: Principle, advantage, technique and applications.	10 Hrs
	17. Tomography - Principle and applications	20 Hrs
	18. Stereography - Procedure - presentation, for viewing, stereoscopes, stereometry. High KV techniques principle and its applications.	20 Hrs

Details of Curriculum for Second Year Diploma in X-Ray Technician

PAPER 2nd Theory	Topics	Hours.
1.**Radiological imaging techniques & patient care.**	19. Soft tissue Radiography including Mammography - its techniques, equipment and applications.	10 Hrs
	20. Localization of foreign bodies. Various techniques	10 Hrs
	21. Ward /mobile radiography - electrical supply, radiation protection, equipment and instructions to be followed for portable/ward radiography.	10 Hrs
	22. Operation theatre techniques: General precautions, Aspesis in techniques - Checking of mains supply and functions of equipment, selection of exposure factors, explosion risk, radiation protection and rapid processing techniques.	30 Hrs
	23. Trauma radiography/Emergency radiography and Paediatric Radiography	25 Hrs
	24. Mammography.	05 Hrs

PAPER 2nd Theory	Topics	Hours.
2.**Bio-medical physics of X-ray machine & developement of X-ray film etc.**	1. Basic Bio-medical physics of X ray machine & Dark room.	50 Hrs
	2. Types of film, cassette, screen, Developer, fixer etc.	30 Hrs

Curriculum
for
Practical :- Second Year
Diploma in X-Ray Technician

	Topics
Practical	**<u>Hands on training of :-</u>**
	1. Preparation of patient for X-ray.
	2. Performing all types of X-rays.
	3. Contrast administration & management of adverse reactions to it.
	4. Protection from radiation hazards.
	5. Performing contrast X rays.
	6. Developing film.
	7. Reading different X rays.
	8. Record keeping.