EXAM SCHEME AND SYLLABUS

(Applicable for the batches admitted from the Academic Session 2023-24 onwards)

Bachelor of X-Ray Radiographer Technology

(BXRT, 3 Year Degree Programme)

FACULTY OF PARAMEDICAL SCIENCE & ALLIED HEALTH SCIENCE

Chirayu University

Bhopal, MP 462030, India

BACHELOR OF X-RAY RADIOGRAPHY TECHNOLOGY (BXRT)
3 YEAR DEGREE COURSE

1. AIMS AND OBJECTIVES

1. AIMS

1.Acquisition ofadequatetheoreticalandthe practicalknowledge and foundation in the basic Pre-clinical, Paraclinical and clinical medical subjects.

2. Proficiency in the diagnosis and skills of basic radiography procedures and techniques with adequate theoretical basisand rationale of allied sciences.

3.To detect and evaluate the anatornical, physiological,radiologicalimpairments, resulting in dysfunction of variousage groups &occupation; as well as epidemiological features in thepopulation & arrive at appropriate diagnosis.

4. To understand the rationale &basic investigative approach tothe medical system and surgical intervention regimens &accordingly plan & implement specific radio therapeutic measures effectively.

5. To practice Professional Autonomy & Ethical principles withreferral as well as first contact clients in conformity with ethicalcode for Radiographers

6.To practice Moral and Ethical values and Evidence BasedPractices with regard to Radiology.

2.OBJECTIVES

The Objective of the course which is complementary to medicine shallbe to allow the students.

1. To acquire adequate theoretical & practical knowledge in thebasic medical subjects.

2. To impartradiography&Diagnostic procedureswith adequate theoretical & practical base.

3. To enable the student to acquire skills in the evaluation &diagnosis of the physical problems presented by the patients.

4. To build up a learning process that shall include living experience, problem oriented approach, case studies &community health care activities.

5. To impart competency in Radiography measure ofspecific choice towards Preventive, Curative, Symptomatic &Restorative or Rehabilitative goals in a variety of health caresettings.

6. To develop • professional autonomy through independentphysical diagnosis and prescription as a Radiographer for all Radiography related referrals and/ or primary clients.

7. To endorse Radiographic moral and ethical codes as perinternational standards and to emphasis on the conduct ofprofessional practice for patient's welfare as the primaryresponsibility.

8. To develop confidence in clinical, teaching and administrativeassignments and continue to seek further knowledge in thefields of Radiography.

9. To introduce the students to the fundamentals of radiography & Diagnostic Research activities.

10. To teach every aspect of National policieson health anddevote himself/ herself to its practical implementation.

1. COURSE STURCTURE

The Degree in Radiography of 3 years(three academic years) course here in after called 3 year degree course shall be designated as BACHELOR OF X-RAY RADIOGRAPHY TECHNOLOGY in short BXRT.

2.DURATION OF THE COURSE: The bachelor of x-ray radiography technology in short (BXRT) is athree Year regular degree course, named below:

i. BXRT - I year
ii. BXRT - II year
iii. BXRT - III year

3. TEACHING DAYS: Each academic year shall consist of 160 teaching days.

SCHEME OF EXAMINATION:
Degree in X-Ray Radiography Technician

BXRT Ist Year								
S.No	Subject	Theory				Practical		Total Marks
		written	Internal	Max	Min.	Max.	Min.	
1	Anatomy and Physiology of Human Body – Part –I	100	100	200	100	100	50	300
2	Radiographic Photography	100	100	200	100	100	50	300
3	Basic Radiological Physics	100	100	200	100	100	50	300
4	Radiation protection & Radiation Prology	100	100	200	100	100	50	300

BXRT IInd Year								
S.No	Subject	Theory				Practical		Total Marks
		written	Internal	Max	Min.	Max.	Min.	
1	Anatomy and Physiology of Human Body – Part -II	100	100	200	100	100	50	300
2	Radiation Physics including Radiation Protection	100	100	200	100	100	50	300
3	Basic Radiographic Techniques	100	100	200	100	100	50	300
4	C.T. imaging techniques & M.R.I. imaging techniques	100	100	200	100	100	50	300

BXRT IIInd Year								
S.No	Subject	Theory				Practical		Total Marks
		written	Internal	Max	Min.	Max.	Min.	
1	Radiotherapy Planning & Quality Control.	100	100	200	100	100	50	300
2	Equipment for Radiodiagnosis including newer development and quality control	100	100	200	100	100	50	300
3	Special Radiographic techniques including special procedures	100	100	200	100	100	50	300
4	Digital Radiography	100	100	200	100	100	50	300

SYLLABUS AND SCHEME OF EXAMINATION:

BACHELOR OF X-RAY RADIOGRAPHER TECHNOLOGY

FIRST YEAR

SYLLABUS & SCHEME OF EXAMINATION

BACHELOROF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-I: HUMAN ANATOMY & PHYSIOLOGY

SCHEMEOFEXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper- I	Human Anatomy& Physiology	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The theory examination shall be of 100 marks with. The theory examination marks for Anatomy shall be50 and for Physiology 50 marks respectively.

There shall be two paper setters/evaluators, one from Anatomy and one from Physiology.

Section-A, which will be set by Anatomy examiner (50marks) and Section-B,by Physiology (50marks) examiner. Recognized teachers in Anatomy and Physiology with five years of experience shall be on the panel of examiners; 50% shall be the minimum passing marks.

The pattern of theory examination for will be asunder for100Max.Marks.

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
TotalMarks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-I: HUMAN ANATOMY & PHYSIOLOGY

Theory - 80 hrs

SYLLABUS CONTENTS

1. Introduction to thebodyasa whole.

The cells:tissues ofthe body**.**

The cell: Structure, multiplication.

Tissues:types,structure,characteristics,functions.

Epithelium: **Simple**: Squamous, Cubiodal, Columnar, Ciliated **Compound:**

Stratified, transactional

Connective:Areolar, adipose,fibrous,elastic,cartilage, bloodandbone.

Muscles: Striated(Voluntary), smooth(involunatary), Cardiac

Nervous

Fibrosis

Cellregeneration

Membranes: mucous,serous,synovial

System Wise Osteology (including whole skeleton, bones and joints) Development of bone (osteogenesis): cells involved Types and function of bone, Types of joints and various movement.

AxialSkeleton:

Skull:cranium,face,air, andsinuses.

Vertebral Column: regions, movement and vertebrae characteristics sternum Ribs

Appendicular skeleton: bones involved–shoulder girdle and upper limb.Pelvic girdle and lower limb.

Healing of bones: cellular activity factors that delay healing. Diseases of bones and joints.

Reference books:

- Anatomy and Physiology for Radiographers -C.A.Warrick
- Gray's anatomy Descriptive and applied-T.B.Johnstor.
- Foundation of Anatomy and Physiology-RossandWilson.
- An Atlas of Normal Radiographic Anatomy -Richard&Alvin
- Essentials of Human Anatomy–Russell
- B.D.Chourasia, Regional anatomy
- Singh Inderbir Singh Text Book of Anatomy: With color Atlas, Jaypee, New Delhi
- Chatterji. C. Human Physiology Medical Allied
- Keele,CyrilA. Samson Wright's Applied Physiology, Oxford University

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-II: RADIOGRAPHIC PHOTOGRAPHY

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-II	Radiographic photography	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from othe college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-II: RADIOGRAPHIC PHOTOGRAPHY

Theory - 80 hrs. Practical / Posting- 120 hrs

SYLLABUS CONTENTS

Radiographic Photography

(i)The photographic process: introduction, visible light, image, produced by radiation, light sensitive photographic materials**.**

(ii) Photographic emulsions: The photographic latent image. Positive process.

(iii) Film materials in x-ray department. History, structure of an x-ray film, single sided films, types of films.

(iv) Spectral sensitivity of film material, graininess of film material, speed and contrast of photo graphic material.

(v) Sensitometry: photographic density, characteristic curve features of the characteristic curve.

(vi) Variation in the Characteristic curve with the development. Comparison of emulsions by their characteristic curves. Information from the characteristic curve.

(vii)The storage of film materials and radiograph: Storage of unprocessed films, storing of radiographs.

(viii) Intensifying screens and cassettes. Luminescence: fluorescence and phosphorescence. Construction of an intensifying screen.

(ix) 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.

(x) Cassette design, care of cassettes, mounting of intensifying screens.

(xi) Care of intensifying screens, tests to check screen film contact and light leakage.

(xii)Film processing: Development: The nature of development, manual, automatic. The PH scale.

(xiii) The constitution of developing solutions and properties of development chemicals.

(xiv) The development time, factors in the use of a developer. Developers in processing systems.

(xv)Film processing: fixing and role of a fixing solution. Constitution of the fixing solutions and properties of the Constituents.

(xvi) Fixers usedinautomatic processors. Factors affecting the use of the fixer.

(xvii) Regeneration offixingsolution.Silver recoveryanditsvarious methods.

(xviii) Rinsing, washingand drying. Objects of rinsing and washing, methods employed. Methods of drying films.

(xix) Preparation of solutions and making stock solution.

(xx) Processing equipment: Materials for processing equipment, processors for manual operation, hangers, and control of chemical temperature by heating and thermostat, immersion heaters as well as cooling methods.

(xxi) Maintenance of automatic processors and common faults.

(xxii)Darkroom: Layout and planning. Dark room construction nature of floor, walls, ceiling and radiation protection.

(xxiii) Typeof entrydoor design.Dark roomillumination.

(xxiv) Dark room equipment and its layout. Location of pass through boxes or cassettes hatches.

(xxv)Systems for day light film handling: Day light systems using cassettes and without cassettes.

(xxvi) The radiographic image: Components in image quality- density, contrast and details.

(xxvii) Unsharpness in the radiographic image. Various factors contributing towards unsharpness.

(xxviii) The presentation of the Radiograph. Identification markers and orientation. Documentary preparation.

(xxix) Viewing accessories: Viewing boxes, magnifiers, viewing conditions.

(xxx) Light images and their recording. The formation of light images. Images formation by mirror, by a lens and aberrations of lenses.

(xxxi) Fluorography: Anoptical system for image intensifier fluorography.

(xxxii) Cameras for fluorography. Sensitometric response of fluorography film.

(xxxiii) Processing equipment and procedures, graininess influorograms.

(xxxiv) Some special imaging processes. Xero radiography, it meaning technique and applications.

(xxxv) Copying radiograph. Its technique and application.

(xxxvi) Subtraction: Its techniques asapplied toradiographyas wellas its applications. **(xxxvii)** Common film faults due to manufacturing as well as due to chemical processing. **(xxxviii)** Management of the quality of the Radiographic image.

Practicals:

A. Test to check the X-ray films and screen contact in the cassette.

B. Test to check light leakage in the cassette.

C. To prepare a characteristic curve of a radio graphic film.

D. To check the effect of safe light on exposed as well as unexposed X-ray film.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-III: BASIC RADIOLOGICAL PHYSICS

SCHEMEOFEXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-III	Basics Radiological physics	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D. Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and
one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02 Essay type Questions *Answer to be given in450-500 words*	**15**	**30**
TotalMarks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (DXRT)

PAPER-III: BASIC RADIOLOGICAL PHYSICS

Theory - 80 hrs. Practical / Laboratory- 20 hrs

SYLLABUS CONTENTS

Structure of matter and principles of machines, electricity and electromagnetism applied in radiological instruments. Physics principles in design and working of x-ray tube technology.

Construction and working principles of transformers and auto transformers used in x-ray circuits. Measurement of voltage special KV meters. Measurement of tube current in milli and microamperes.

Principles of thermionic emission and rectification in x-ray technology. High voltage D.C. circuits in imaging and therapy tube circuits.

Electrical hazards and safety x-ray tube rating in imaging and therapy x-ray tubes and thermal safety.

Introduction to intensity of radiation in general and its variation by distance. Introduction to eletro-magnetic spectrum, definition of wavelength and its quantum relationship with peak kilovoltage.

Physical principles of radiation and optical field coverage and the factor affecting the field projected on patient during x-ray imaging and radiotherapy exponential and trigonometric functions used in radiological calculations.

Book references:

Textbook of Radiology- Bhargava

Manual of Radiographic technique

Radiological Procedure- Bhargava

Review of Radiology- Sumer K Sethi

Radiographic Imaging- DN & MO Chesney

Medical Radiographic Technique & Dark Room Practices- Krishnamurthy

Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-IV: RADIATION PROTECTION AND PROLOGY

SCHEMEOFEXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-IV	Radiation protection and prology	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Asst. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Asst. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10Very short answer Questions *Answer to be given in50-60 words*	**02**	**20**
05Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02 Essay type Questions *Answer to be given in450-500 words*	**15**	**30**
TotalMarks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (DXRT)

PAPER-IV: RADIATION PROTECTION AND PROLOGY

Theory - 40 hrs. Practical / Laboratory- 60 hrs

SYLLABUS CONTENTS

- Definition of radiation hazards maximum permissible dose and annual limit of intake (ALI), permissible dose levels on and around sealed source housing and installation principles of radiation protection and MPD's of different ICRP rules, stochastic and non-stochastic effects
- Importance of'ALARA' physical principles of design and planning of radiation installation.
- Safe work practice in teletherapy and Brachtherapy.
- Shielding materials, radiation surveys and personnel monitoring devices film badges.TLD badges, pocket dosimeters.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS AND SCHEME OF EXAMINATION:

BACHELOR OF X-RAY RADIOGRAPHER TECHNOLOGY

SECOND YEAR

SYLLABUS & SCHEME OF EXAMINATION

BACHELOROF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-I: ANATOMY & PHYSIOLOGY OF HUMAN BODY

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper- I	Anatomy and physiology of human body	100	100	100	300

INSTRUCTIONFORTHEPAPERSETTER

The theory examination shall be of 100 marks with. The theory examination marks for Anatomy shall be 50 and for Physiology 50 marks respectively.

There shall be two paper setters/evaluators, one from Anatomy and one from Physiology.
Section-A, which will be set by Anatomy examiner (50marks) and Section-B, by Physiology (50marks) examiner. Recognized teachers in Anatomy and Physiology with five years of experience shall be on the panel of examiners; 50% shall be the minimum passing marks.
The pattern of theory examination for will be asunder for**100 Max. Marks**.

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05 Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
TotalMarks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-I: ANATOMY & PHYSIOLOGY OF HUMAN BODY

Theory – 80 hrs. Practical / Laboratory- 40 hrs

SYLLABUS CONTENTS

Types of cells, tissues, bones and joints. Introduction to system and cavities of the body.

The respiratory system: Organs: Positions and structure nose and nasal cavities

Functions: respiratory, olfactory,

Pharynx Larynx–**Functions**: respiratory, vocal Teaches, Bronchi**, lungs:** lobes, lobules,

pleura.

Respiratory function: External and internal respiration common terms relating to diseases and conditions of the system.

(2) Cardiovascular System
(3) AlimentarySystem
(4) ExcretorySystem
(5) Reproductive System
(6) Nervous System
(7) LymphaticSystem
(8) Haemopoietic System
(9) Special senseOrgans

Heart and Blood vessels(Circulatory system) Blood vessels: arteries, veins, capillaries, sinusoids, structure and functions. Heart: Position, structure and functions. Circulation of Blood: Pulmonary, systemic, portal, main blood vessels, their origins and distribution, diseases of blood vessels and Heart and conditions of the system.

The Lymphatic System:

The parts of the lymphatic system.

Lymph channels: Capillaries. Vessels, ducts, structure and functions. Lymph nodes: Position, structure and functions.

Lymphatic tissues: Tonsils, adenoids, and intestinal nodules.

Spleen: Position, structure and functions, diseases and conditions of the system.

The Digestive System:

Elementary tract structure: Mouth, pharynx, salivary glands, oesophagus, stomach, liver, gall bladder,

Small intestine, large intestine: Position, structure and functions of these organs. Digestion and Absorption, metabolism of carbohydrates, proteins and fats. Diseases and conditions of the system.

The Urinary System:

Parts of urinary system. Position, structure and functions. Kidneys, ureters, urinary bladder and urethera. Formation and composition of urine. Water and electrolyte balance. Diseases and conditions of the system. The Reproductive System: Female Reproductive system:

External genitalia:

Position, structure and functions. Perineum. Internal organs: Position and structures, Vagina, uterus tubes, ovaries. Menstrual cycle: Stages, hormone control, and ovulation. Breasts (Mammary glands).Changes: Puberty in pregnancy, during lactation.

Male Reproductive System:

Scrotum, testis, and epididymus: Position, structure and functions. Spermatogenesis. Spermatic cords,seminal vesicles.

Ejaculatory ducts: Position, structure and functions. Prostate gland Functions of male reproductive system, Puberty. Diseases of female and male reproductive system.

The Endocrine System:

Endocrine glands, Pituitary and hypothalamus: Position and structure. Thyroid gland, Parathyroid glands. Adrenal (Supra renal) glands. Pancreas: Position, typesof cells. Hormones: secretion, function & control, pineal gland. Common terms and diseases related to the system.

The Organs of Sense:

Hearing and the ear: External, middle and inner ear. Physiology of hearing & diseases of ear
Sight and the eye: Position, structure, sclera, cornea, choroids, ciliary body, iris, lens, retina, and optic nerves. Physiology of sight and diseases of the eye.

Sense of smell: Olfactory nerves, origins, distribution. Physiology of smell. Sense of taste.

The Nervous system:

Neurones:Structure,types andproperties.

Central nervous system: nerves, neuralgia meninges.

Ventricles of brain,C.S.F.

Brain,spinal cord:Structure,functions peripheralnervous system.

Spinal andcranial nerves: Origin distribution &functions. Automatic nervoussystem: Sympathetic andParaSympathetic:Origin distributionfunctions.

Commondiseases ofthesystem.

TheSkin:

Structure of skin, epidermis, dermis, functions of skin, hypothermia.

Wound healing: Primary and secondary diseases of skin.

Book references:

Referencebooks

- Anatomy and Physiology for Radiographers -C.A.Warrick
- Gray's anatomy Descriptive and applied-T.B.Johnstor.
- Foundation of Anatomy and Physiology-RossandWilson.
- An Atlas of Normal Radiographic Anatomy -Richard&Alvin
- Essentials of Human Anatomy–Russell
- B.D.Chourasia, Regional anatomy
- Singh Inderbir Singh Text Book of Anatomy: With color Atlas, Jaypee, New Delhi
- Chatterji. C. Human Physiology Medical Allied
- Keele,CyrilA. Samson Wright's Applied Physiology, Oxford University

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-II: Radiation Physics Including Radiation Protection

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-II	Radiation Physics including Radiation Protection	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No. and Type of Questions	Marks for each Question	Total Marks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05 Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02 Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER- II: Radiation Physics Including Radiation Protection

Theory – 80 hrs. Practical / Laboratory- 40 hrs

SYLLABUS CONTENTS

Atomic structure as applied to generation of x-rays and radioactivity spectrum of diagnostic imaging and therapy x-rays. Effects of variation of tube voltage, current, filtration, HT wave form and target material on x-ray production. Laws of radioactivity and decay schemes of different alpha,beta,gamma ray, negatron and positione mitters as used in medicine especially in radiotherapy. Artificial radionuclide generators employed in medicine in general and radiotherapy sources in particular. Interaction of radiation with matter attenuation absorption and scattering phenomena. Photo electric absorption, Compton scattering, pair production and annihilation process, ionisation, effects of geometry of thickness of the absorber. Dependence on the nature and atomic number of the absorber and on radiation quality. Transmission of x- ray through body tissues. Linear energy transfer. Range of secondary electrons and electron build up. Relative amount sof scatter from homogeneous and heterogeneous beam during the passage through a patient. Physical requirements of beam defining devicese.g.cones, diaphragm, collimators etc. Units of radiation measurement specification of quality and half-valve thickness (HVT) and its measurements, filters and filtration. Measurements of radiation and dosimetric procedures. Radiation detectors and their principles of working. Definitions of Bragg-peak, percentage depth dose, and peak scatter factor, tissue air-ratio, tissue maximum ratios scatterair ratio, isodose curves and radiation penumbra of different beams. Wedge filters, scattering foils. Physics properties of phantoms, phantom materials,bonusandbolus substitutes.Factors used for treatment dose calculation method. Physical aspects of electron and neutron beam therapy.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-III: Basic Radiographic Techniques

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-III	Basic Radiographic Techniques	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners. The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10VeryshortanswerQuestions *Answer to begiven in50-60words*	**02**	**20**
05ShortanswerQuestions *Answer to begivenin250-300 words*	**10**	**50**
02EssaytypeQuestions *Answer to begivenin450-500 words*	**15**	**30**
TotalMarks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER- III: BASIC RADIOGRAPHIC TECHNIQUES

Theory – 80 hrs. Practical / Laboratory- 50 hrs

SYLLABUS CONTENTS

Skeletal system: Radiography techniques for x-ray of:

(a)Upper limb with special reference to hand, wrist joint, and elbow joint, supplementary techniques for carpal tunnel, scaphoid bone fracture, head of radius and supra-condylar projections.

(b)Lower limb which includes all the bones with special reference to ankle joint, knee joint, patella, techniques for calcaneum bone,supplementary techniques for flat,Inter condylar notch and femur and metatarsals, etc.

(c)Shoulder girdle and thorax.

(d) Vertebral column with special techniques for cervical spine, intervertebral joints and formina. Limbo-sacral joint.

(e) Pelvic girdle andhipregion.

(f)Respiratory system chest radiography for both the lungs, apical, lordotic and oblique views, techniques to decubitus APand lateral views.

Skull: Radiography of cranial bones, cranium, sellaturcica, orbit, optic foramina, superior orbital fissure and inferior orbital fissure.

FacialBones: Para nasal sinuses.Temporal bone.

DentalRadiography: Radiography of teeth-intra oral, extra oral and occlusal view.

AlimentaryTract: Preparation of patients, contrast media for swallow, meal and enema.

Abdomen: Preparation of patient. General, acute positioning for fluid and air levels. Plain Film examination. Radiography of female abdomen to look for pregnancy: Intravenous Pyelography and cystography.

Macroradiography: Principle, advantage, technique and applications.

Stereography: Procedure- presentation for viewing, stereoscopes, stereometry.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-IV: C.T. IMAGING TECHNIQUES & MRI IMAGING TECHNIQUES

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-IV	C.T. Imaging techniques & MRI imaging techniques	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners. The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10VeryshortanswerQuestions *Answer to begiven in50-60words*	**02**	**20**
05ShortanswerQuestions *Answer to begivenin250-300 words*	**10**	**50**
02EssaytypeQuestions *Answer to begivenin450-500 words*	**15**	**30**
TotalMarks		**100**

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER- IV: C.T. IMAGING TECHNIQUES & MRI IMAGING TECHNIQUES

Theory – 80 hrs. Practical / Laboratory- 50 hrs

SYLLABUS CONTENTS

Basic Physics of CT & MRI, Basic Computer Operation, Positioning in CT & MRI. Different types of Contrast materials.Radiation Hazards and MRI Hazards. Factor affecting quality of images.

Basic data acquisition comcepts, reformation and reconstruction of CT images and image archieving.

CT planning of Head, Neck, Thorax, Abdomen, Pelvis. Musculoskeletal System, Spine and PNS, Patient preparation and handling.

Historical background, various generation of scanner, advancements in CT Technology (helical multislice and spiral) ultra fast scanners, CT guided interventions procedure and CT Angiography.

Emergencies in C.T. Departments – contrast media and its reactions, anaphylaxis.

MRI–History, advantage over other modalities, equipment terminology NMR signals, pulse sequences, site selection and safety, strength and limitations of MRI.

MRI of Head & Neck, Thorax, Abdomen. Musculoskeletal system.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS AND SCHEME OF EXAMINATION:

BACHELOR OF X-RAY RADIOGRAPHER TECHNOLOGY

THIRD YEAR

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-I: RADIOTHERAPY PLANNING & QUALITY CONTROL

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-I	Radiotherapy Planning & Quality Control.	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10VeryshortanswerQuestions *Answer to begiven in50-60words*	**02**	**20**
05ShortanswerQuestions *Answer to begivenin250-300 words*	**10**	**50**
02EssaytypeQuestions *Answer to begivenin450-500 words*	**15**	**30**
TotalMarks		**100**

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-I: RADIOTHERAPY PLANNING & QUALITY CONTROL

Theory – 80 hrs. Practical / Laboratory- 50 hrs

Demonstration:

Definition of treatment planning.

Planning procedure in general with special emphasis on tumour localization and target volume measurement by conventional radiographic method and simulator imaging.

Role of special contrast medium base radiothearpay, CT/NRI/ Ultra sound /radionuclide imaging methods.

Physical and clinical requirement of field selection of Treatment in tele therapy.

Role of portal films in treatment planning.

Choice of central axis percentage depth does data and isodose curves from a spectrum of radiotherapy beams used for treatment.

Requirement and practice of organ shielding single, multiple field spendulum and rotational field therapy planning procedure.

Computerized treatment planning system choice of does, time and fractionation. Safety of critical organ in planning methods.

Role of treatment shall immobilization devices and laser in patients setup and positioning.

Acceptance tests on therapy simulators, teleisotope, megavoltage X-ray and electron beam machines.

Contribution of technologist in radiation calibiratition,
quality control, assurance in execution of radiation treatment,

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-II: Equipment for Radio-diagnosis including newer Development and quality control

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-II	Equipment for Radio-diagnosis including newer Development and quality control	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05 Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02 Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
TotalMarks		**100**

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-II: Equipment for Radio-diagnosis including newer Development and quality control

Theory – 80 hrs. Practical / Laboratory- 50 hrs

Demonstration: Computed tomography: Historic developments, its principle and applications, various generations and applications, various generations and definition of term and cross sectional anatomy.

Diagnostic Ultrasound: Its principle, applications and role in medicine. Various types of transducers and definition of terms and cross sectional anatomy.

Digital radiography: Principle scanned projection radiography, digital substraction angiography, applications and definition of terms.

M.R.I Principle, applications ,its advantage over computed tomography or ultra sonography. Its limitations and uses and cross sectional anatomy.

Quality Assurance in Radio diagnosis: Aim of quality assurance in medical care Contents of a Q.A. Programme i.e. phases of development of a radiological facility. Q.A. activities applicable in.

i. Equipment section phase.
ii. Equipments installation of acceptance phase.
iii. Operational phase

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-III: RADIOGRAPHY:-TECHNIQUES INCLUDING SPECIAL PROCEDURES

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-III	Radiography:-Techniques including special procedures	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D. Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No. and Type of Questions	Marksforeach Question	TotalMarks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05 Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02 Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
TotalMarks		**100**

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-III: Radiography:-Techniques including special procedures

Theory – 80 hrs. Practical / Laboratory- 50 hrs

Radiological procedure pertaining to salivary glands, lacrimal system, bronchography, arthrography and hysterosalp angiography-various requirements trolley setup, indications and contraindications, contrast media used.

Ventriculography and Encephalography-Technique, contrast media used, film sequence indication and cotraindications.

Myelography: Techniquescontrast media usedinjectionofcontrastmediaindications and contraindications.

Intravenous Cholangiography, T.Tube: Cholangiography, preoperative/Cholangiography, procedure. Contrast media, indication & contraindication.

Double contrast Barium studies (small bowel enema, Ba eneme etc) procedure, requirement indications contraindication and contrast media used

Angiography: Cerebral, cardiac abdominal aortography general, renal and selective renal spleno portovenography peripheral arterial and venous angiography, precautions radiation protection film changers manual automatic biplane film type-large miniature cinecontrast media injection procedure and technique.

Interventional radiological procedures:

PTSPTCPC in needle aspiration cytology, percutaneous nephrostomy cardiac cathaerization - embolization dilations etc.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-IV: Digital Radiography

SCHEME OF EXAMINATION

Paper	Subject	Theory	Internal Assessment	Practical	Total
Paper-IV	Digital Radiography	100	100	100	300

INSTRUCTION FOR THE PAPER SETTER

The University theory examination shall be of 100 marks and question paper will be set by Astt. Professor, M.D.Radiodiagnosis , who shall be on the panel of examiners, 50% shall be the Minimum passing marks. Internal assessment will be of 100 marks, which would be counted in theory marks for passing university examination. For practical examination; there will be two examiner (Astt. Professor -M.D. Radiodiagnosis) - one internal Examiner from the institute /college and one from other college /institute of the university from the panel of University examiners.
The pattern of University theory examination will be as under for 100 Max. Marks in question paper and distribution of marks for questions will be as under

No.andTypeofQuestions	Marksforeach Question	TotalMarks
10 Very short answer Questions *Answer to be given in50-60words*	**02**	**20**
05 Short answer Questions *Answer to be given in250-300 words*	**10**	**50**
02 Essay type Questions *Answer to be given in 450-500 words*	**15**	**30**
TotalMarks		**100**

SYLLABUS & SCHEME OF EXAMINATION

BACHELOR OF X-RAY RADIOGRAPHY TECHNICIAN (BXRT)

PAPER-IV: Digital Radiography

Theory – 80 hrs. Practical / Laboratory- 50 hrs

Digital Radiography Basic principles and compounded Radiography and internal working procedure, C.D. Priminary of images.

Digital Radiography Systems

Image acquisition, Photostimulable phosphors, digital chest radiography and future developments

Digital SpotImaging(DSI)

Picture characteristics, archiving possibilities : transfer system and designs.

Mammography System

Background, diagnosis and screening.

Imaging requirements

Equipment–tube, compression, grids, AEC

Imagereceptor requirements.

Radiation dose, Image quality

Interventional–accessories Biopsy

equipment attachments.

Film archieving systems

Image recording devices, Laser imager/camera-functioning, Multi formatter, Automatic film handling systems.

Picture archieving and communications system(PACS)

Optical Disc System(ODS)

Film archieving systems–MOD/disc/PACS etc.

Book references:

- Textbook of Radiology- Bhargava
- Manual of Radiographic technique
- Radiological Procedure- Bhargava
- Review of Radiology- Sumer K Sethi
- Radiographic Imaging- DN & MO Chesney
- Medical Radiographic Technique & Dark Room Practices- Krishnamurthy
- Radiographic Positioning – Niranjana Baghel
- They physics of radiation therapy, Faiz M.Khan, 4th edition(2010),Lippincott,WilliamsandWilkins,USA.
- Physics for Radiography-HayandHughes