मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University Under Ministry of Education, Government of India)
Accredited 'A+' grade by NAAC

SCHOOL OF SCIENCES

Department of Vocational Studies and Skill Development

Credits and Scheme of Examination (Session 2019 to 2021)

B. Voc. (Medical Imaging Technology)

SEMESTER- I

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					ExternalAssessment	Internal Assessment	ExternalAssessment	Internal Assessment	
1.	Skill Paper - 1	Conventional Radiography & Equipment (Theory)	BVMI101CCT	04	70	30	---	---	100
		Conventional Radiography & Equipment (Lab)	BVMI101CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Radiographic & Image Processing Techniques (Theory)	BVMI102CCT	04	70	30	---	---	100
		Radiographic & Image Processing Techniques (Lab)	BVMI102CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Human Anatomy & Physiology Part-I (Theory)	BVMI103CCT	04	70	30	---	---	100
		Human Anatomy & Physiology Part-I (Lab)	BVMI103CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	English Communication Skills (Theory)	UGEN101AET	04	70	30	---	---	100
5.	Non-Skill Paper - 5	Applied Physics (Theory)	BVPH101PET	03	35	15	---	---	50
		Applied Physics (Lab)	BVPH101PEP	01	---	---	35	15	50
6.	Non-Skill Paper - 6	Basic Computers and Information Science (Theory)	BTCS102PCT	03	35	15	---	---	50
		Basic Computers and Information Science (Lab)	BTCS150PEP	01	---	---	35	15	50
		Total		**30**					**750**
Mandatory Non CGPA Courses									
7	Non-Skill Paper - 7	Islamiyat (Theory)	UGIS101NCT	02	35	15	---	---	50
		Total		**.30**					**50**

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SCHOOL OF SCIENCES
Bachelor of Vocational Programme M.I.T. & M.L.T.

B. VOC. (MEDICAL IMAGING TECHNOLOGY)
I - SEMESTER (SYLLABUS)

Component	Title of The Paper	Credits
Skill Paper - 1	Conventional Radiography & Equipment	04
	Conventional Radiography & Equipment Lab	02
Skill Paper - 2	Radiographic & Image Processing Techniques	04
	Radiographic & Image Processing Techniques Lab	02
Skill Paper - 3	Human Anatomy & Physiology Part-I	04
	Human Anatomy & Physiology Part-I Lab	02
Non Skill Paper - 4	General English (English Communication Skills) (Theory)	04
Non Skill Paper - 5	Applied Physics	03
	Applied Physics Lab	01
Non Skill Paper - 6	Basic Computers and Information Science	03
	Basic Computers and Information Science Lab	01
	Total Credits	**30**
Non CGPA Courses		
	Islamiyat	02

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B. Voc. (Medical Imaging Technology)

SEMESTER-I

(Skill Paper - 1) Conventional Radiography & Equipment (Theory)

Credits – 04

1. Production of x-rays: X-ray tube, gas filled x-ray tube, construction working and limitations, stationary anode x-ray tube; construction, working, methods of cooling the anode, rating chart and cooling chart; rotating anode x-ray tube; construction, working rating chart, speed of anode rotation, angle of anode inclination, dual focus and practical consideration in choice of focus, anode heel effect, grid controlled x-ray tube effect of variation of anode voltage and filament temperature, continuous and characteristics spectrum of x-rays, inherent filter and added filter, their affection quality of the spectrum

2. High tension circuits. H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit, three phase 12 rectifier circuit, high and medium frequency circuits capacitance filter control and stabilizing equipment, mains voltage compensator, mains resistance compensator, compensation for frequency variation, control of tube voltage, kV compensator, high tension selector switch, filament circuit, control of tube current, space charge compensation.

3. Meters and exposure timers. Moving coil galvanometer construction and working conversion to millimeter, ammeter and voltmeter, meters commonly used in diagnostic x-ray machines, pre reading kV meter and millimeter digital panel meters. Clockwork timers, synchronous motor timer, electronic timers, photo metric timers (fluorescent and photoelectric effect as applied in timerstation chamber based timers, integrated timer.

4. Interlocking circuits Relays description and working. Use of relays in diagnostic machines for over load protection, circuit diagram; simplified circuit and bock diagrams illustrating sequence of events from mains supply to controlled emission of x-rays.

5. Control of scattered radiation. Beam limiting device cones diaphragms light beam collimator, beam centering device, methods to verify beam centering and field alignment; design and control of scattered radiation, grid ration grid cut-off parallel grid, focused grid, crossed grid, grided cassettes, stationary and moving grid potter bucky diaphragms, various types of grid movements, single stroke movement, oscillatory movement and reciprocatory movement.

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6. Fluoroscopy fluorescence and phosphorescence-description, fluorescent materials used in fluoroscopic screens construction of fluoroscopic screen and related accessories, tilting table, dark adaptation image intensifier-construction and working, advantages over fluoroscopic device, principals and methods of visualizing intensified image, basic principles of closed circuit television camera and picture tube Vidicon camera, CCD automatic brightness control, automatic exposure control, chamber selection during fluoroscopy. Serial radiography. Manual cassette changer, rapid automatic film changer, basic principles of cine fluoroscopy and angiography use of grid controlled x-ray tube.

7. Care and Maintenance of X-ray equipment.

8. General care functional tests, testing the performance of exposure timers, assessing the MA settings, testing the available kV. Measurement of focal spot of an x-ray tube, testing the light beam diaphragm, practical precautions pertaining to brakes and locks, H.T. cables, meters and controls, tube stands and tracks as well as accessory equipment.

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SEMESTER-I

(Skill Paper - 2) Radiographic and image processing techniques (Theory)

Credits – 04

1. The photographic process introduction, visible light, images produced by radiation, light sensitive photographic materials.
2. Image characteristic. Real and mental images, reflected, transmitted and emitted light images photographic emulsions. The photographic latent images positive process.
3. Film materials in X-ray, departments, history, structure of an x-ray film, single and double emulsion films, types of films cross over effect.
4. Spectral sensitivity of film material, graininess of film material, speed and contrast of photographic materials.
5. Sensitometry Photographic density, characteristic curves, features of the characteristic curve.
6. Variation in the characteristic curve with the development comparison of emulsions by their characteristic curve information from the characteristic curve. The storage of film materials and radiograph. Storage of unprocessed films, storing of radiographs-expiry date. Shelf life, storage condition, stock control.
7. Intensifying screens and cassettes. Luminescence fluorescence and phosphorescence. Construction of an intensifying screen.
8. 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. And quantum mottle.
9. Cassette design care of cassettes types of cassettes and mounting of intensifying screens, loading and unloading of cassettes.
10. Care of intensifying screens tests to check screen film contact and light leakage.
11. Film processing development the nature of development manual or automatic. The PH scale.
12. The constitution of developing solutions both in manual and automatic processing and properties of developing chemicals.
13. The development time factors in the use of a developer, developer activity.
14. Film processing fixing and role of a fixing solution constitution of the fixing solutions and properties of the constituents.
15. Fixer used in automatic processor factors affecting the use of the fixer
16. Regeneration of fixing solution silver recovery from waste fixer or from scrap film and its various methods
17. Rising washing and drying objects of rinsing and washing methods employed methods of drying films.
18. Preparation of solutions and making stock solution

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19. Processing equipment materials for processing equipment processors for manual operation hangers control chemicals temperature by heating and thermostat, immersion heaters as well as cooling methods.
20. Maintenance of automatic processors and common faults
21. Dark room layout and planning. Dark room construction – nature of floor, walls, ceiling and radiation protection.
22. Type of entry door design dark room illuminations – white light and safe lighting.
23. Dark room equipment and its layout location of pass through boxes or cassette hatches.
24. Systems for daylight film handing daylight systems using cassettes and without cassettes
25. The radiographic image components in image quality-density contrast and detail
26. Unsharpness in the radiographic image various factors contributing towards unsharpness geometric photographic motional mottle graininess distortion
27. The presentation of the radiograph identification markers and orientation
28. Documentary preparation.
29. Viewing accessories viewing boxes magnifiers viewing conditions.
30. Light images and their recording the laser imager, CRT cameras, Video-imagers dry silver imaging.
31. Photo flurographic cine cameras, cine flurography, cine film, serial cameras, processing of cine films flurographic films.
32. Cameras for photo flurography, Xero-radiography its meaning, technique and applications.
33. Some special imaging processes. Xero-radiography its meaning, technique and applications.
34. Copying radiograph its techniques and applications.
35. Subtraction: its techniques applied to radiography as well as its applications.
36. Common film faults due to manufacturing as well as due to chemical processing.
37. Management of the quality of the Radiographic images and image quality control.

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SEMESTER-I

(Skill Paper - 2) Radiographic and image processing techniques (Lab/Practical)

Credits – 02

1. Test to check the x-ray films and screen contact in the cassette
2. Test to check light leakage in the cassette.
3. To prepare a characteristic curve of a radiographic film
4. To check the effect of safe light on exposed as well as unexposed x- ray film

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SEMESTER-I

(Skill Paper - 3) Human Anatomy & Physiology Part-I (Theory)

Credits – 04

Anatomy is a key component of all education programmes for MRITs and should have a strong focus on organ position. Orientation and relationships. The topics provide the student with an understanding of the structure and relationships of the systems and organs of the body which is essential in patient preparation and positioning. The radiographic anatomy component will enable MRITs to evaluate images prior to reporting by the radiologist.

Similarly ***Physiology*** provides the students with knowledge of the function of systems and organs and their relationships and underpins the understanding of how various imaging modalities are to be selected depending upon the clinical history.

1. Introduction to the body as a whole
2. The cells. Tissues of the body
3. The cell: Structure, multiplication
4. Tissue: Types, Structure, Characteristics, functions
5. Epithelium
6. Simple: Squamous, Cuboidal, columnar, ciliated
7. Compound: Stratified, transitional
8. Connective: Areolar, adipose, fibrous, elastic, Cartilage, blood and bone
9. Muscle: Striated (Voluntary), Smooth (Involuntary, Cardiac)
10. Nervous tissue
11. Fibrous tissue
12. Cell regeneration
13. Membranes: Mucous, Serous, Synovial
14. Osteology (including whole skeleton, bones and joints)
15. Development of bone (ontogenesis): Cells involved
16. Types and functions of bone. Types of joints and various movements.
17. AXIAL Skelton.
    a. Skull: Cranium, Face, air sinuses
    b. Vertebral column: regions, movements and characteristics
    c. Sternum
    d. Ribs
18. Appendicular skeleton: Bones involving-Shoulder girdle and Upper limb, Pelvic girdle and lower lib, healing of bones: cellular activity, Factors that delay healing, Diseases of bones and joints.

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19. The Respiratory System:
    a. Organs: Position and structure
    b. Nose and nasal cavities
    c. Functions: respiratory, Olfactory
    d. Pharynx
    e. Larynx: Functions-respiratory, vocal
    f. Trachea. Bronchi, Lungs: lobes, lobules, pleura
20. Respiratory functions: Eternal and internal respiration, common terms relating to disease and conditions of the system.

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SEMESTER-I

(Skill Paper - 3) Human Anatomy & Physiology Part-I (Lab/Practical)

Credits – 02

1. Study of Human Skeleton parts with skeletal models.
2. Study with charts and models models of all organ systems mentioned above.
3. Microscopic slides examination of elementary human tissues, cells.

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B. Voc. (Medical Imaging Technology)

SEMESTER-I

(Non - Skill Paper - 4) English Communication Skills

Credits – 04

UG Ability Enhancement, Skill Enhancement and Generic Elective Courses

Course Objective: To introduce students to the sounds of English and impart to them the basic communication skills in English.

Unit	Course Content	Instruction Hours
I	**The Sounds of English** The classification and description of consonants sounds The classification and description of vowel sounds Transcription & English pronunciation practice	15
II	**Greetings and Pleasantries** Leave taking Compliment extension Regrets and apologizing Thanking gratitude showing **Making Enquiries** Making request seeking help Giving advice making suggestions Seeking and giving directions	15
III	**English Phrases and Idioms** **Common Errors**	15
IV	**Writing Skills** Sentence construction Paragraph writing Letter writing E-mail, SMS & Invitation writings	15

Recommended Reading:

1. Adrian Doff 2014 Bl Pre-Intermediate Coursebook English Unlimited, Special Edition CUP.
2. Adrian Doff 2014 Bl Plus-Intermediate Coursebook English Unlimited, Special Edition CUP.

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3. Alison Reid 2011 Spoken English Godwill Publishing House.

4. Bansal R.K. & J.B. Harrison (2000) Spoken English for India Mumbai: Orient Longman.

5. Habeeb. G. (2013) English for Speakers of Urdu A Proficiency Course Orient Blackswan.

6. Jack C Richards & David Bohike Speak Now 1,2,3,4 OUP (Four Level Speaking Course)

7. Laz Taylor Alatans Lane & Keith Harding and Adrian Wallwork 2013 International Express Elementary Student's Pack OUP.

8. Murphy, R (2012) English Grammar in use 4th edition Cambridge university press.

9. Sasikumar V&P. V. Dhanija (2011) Spoken English New Delhi Tata McGraw Hill.

10. Taylor. G (2001) English Conversation Practice Tata McGraw Hill.

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B. Voc. (Medical Imaging Technology)

SEMESTER-I

(Non - Skill Paper - 5) Applied Physics (Theory)

Credits – 03

1. Units & Dimensions: M.K.S. fundamentals & derived units, S.L base units supplementary units and derived units, Dimensions of various physical quantities, uses of dimensional analysis.

2. Surface Tension and Viscosity: molecular forces, molecular theory of surface tension surface energy, capillary action, concept of viscosity, coefficient of viscosity, principle and construction of viscometers.

3. Vibrations: Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance Effects of vibrations on building bridges and machines members.

4. Heat: Temperature and its measurement, thermoelectric, platinum resistance thermometers and pyrometers. Conduction through compound media and laws of radiations.

5. Ultrasonics: Productions of ultrasonic waves by magnetostriction and piezo-electric effect, application of ultrasonics in industry.

6. Optics: Nature of light, reflection and refraction of a wave from a plane surface Overhead projector and Epidiascope.

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SEMESTER-I

(Non - Skill Paper - 5) Applied Physics (Lab/Practical)

Credits – 01

1. To determine the surface tension of a liquid by rise in capillary.
2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a sonometer.
4. To determine the frequency of AC main using sonometer.
5. Time period of a cantilever.

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B. Voc. (Medical Imaging Technology)

SEMESTER-I

(Non - Skill Paper - 6) Basic Computers and information science (Theory)

Credits – 03

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS Windows, Word Processing, Excel data worksheet and PowerPoint presentation. Topics to be covered under the subject are as follows:

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices (Keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image, projector, voice response systems).
3. Processor and memory: The central processing unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and,
6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.

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10. Computer Networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), Network topologies (star, ring bus, mesh, tree, hybrid), components of network.

11. Internet and its Applications: definition, brief history, basic service (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

12. Application of Computers in clinical settings.

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B. Voc. (Medical Imaging Technology)

SEMESTER-I

(Non - Skill Paper - 6) Basic Computers and information science (Lab/Practical)

Credits – 01

Practical on fundamentals of computers:-

1. Learning to use MS office: MS word, MS PowerPoint, MS Excel.
2. To install different software.
3. Data entry efficiency.

   Maximizing, etc.).

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मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

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SCHOOL OF SCIENCES

Department of Vocational Studies and Skill Development

Credits and Scheme of Examination (Session 2019 to 2021)

B. Voc. (Medical Imaging Technology)

SEMESTER- II

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					ExternalAssessment	Internal Assessment	ExternalAssessment	Internal Assessment	
1.	Skill Paper - 1	Human Anatomy & Physiology Part-II(Theory)	BVMI203CCT	04	70	30	---	---	100
		Human Anatomy & Physiology Part-II (Lab.)	BVMI203CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Modern Radiological & Imaging Equipment Including Physics (Theory)	BVMI201CCT	04	70	30	---	---	100
		Modern Radiological & Imaging Equipment including physics (Lab.)	BVMI201CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Contrast & Special Radiography Procedures(Theory)	BVMI202CCT	04	70	30	---	---	100
		Contrast & Special Radiography Procedures (Lab.)	BVMI202CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	Research Methodology & Biostatistics (Theory)	BVMI201PET	03	70	30	---	---	100
		Research Methodology & Biostatistics (Lab.)	BVMI201PEP	01	---	---	35	15	50
5.	Non-Skill Paper - 5	Medical Law and Ethics(Theory)	BVMI202PET	03	70	30	---	---	100
		Medical Law and Ethics (Lab.)	BVMI202PEP	01	---	---	35	15	50
6.	Non-Skill Paper - 6	Environmental Studies (Theory)	UGBT201AET	04	70	30	--	--	100
		Totai		30					850
Mandatory Non CGPA Courses									
7	Non-Skill Paper - 7	Islamiyat(Theory)	UGIS201NCT	02	35	15	---	---	50
		Total		30					50

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B. VOC. (MEDICAL IMAGING TECHNOLOGY)
II - SEMESTER (SYLLABUS)

Component	Title of The Paper	Credits
Skill Paper - 1	Human Anatomy & Physiology Part-II (Theory)	04
	Human Anatomy & Physiology Part-II (Lab)	02
Skill Paper - 2	Modern Radiological & Imaging Equipment including physics (Theory)	04
	Modern Radiological & Imaging Equipment including physics (Lab)	02
Skill Paper - 3	Contrast & Special Radiography Procedures (Theory)	04
	Contrast & Special Radiography Procedures (Lab)	02
Non Skill Paper - 4	Research Methodology & Biostatistics (Theory)	03
	Research Methodology & Biostatistics (Lab)	01
Non Skill Paper - 5	Medical Law and Ethics (Theory)	03
	Medical Law and Ethics (Lab)	01
Non Skill Paper - 6	Environmental Studies (Theory)	04
	Total Credits	**30**

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Skill Paper - I) Human Anatomy & Physiology Part-II (Theory)

Credits – 04

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

1. **Heart and blood vessels (Circulatory system):**
   a. Blood vessels: arteries, veins, capillaries, sinusoids, structure and functions.
   b. Heart: Position, structure and functions
   c. Circulation of blood: pulmonary, systemic, portal, main blood vessels, their origins and distribution Diseases of blood vessels and heart and conditions of the system.

2. **The Lymphatic system:**
   a. The parts of the lymphatic system.
   b. Lymph channels: Capillaries, vessels, ducts structure and functions.
   c. Lymph nodes: position, structure and functions.
   d. Lymphatic tissues: tonsils, adenoids, intestinal nodules.
   e. Spleen: position, structure and functions, diseases and conditions of the system.

3. **The digestive system:**
   a. Elementary tract structure:
   b. Mouth, pharynx, salivary, glands, esophagus, stomach, liver, gall bladder, small intestine, large intestine; Position, structure and functions of these organs.
   c. Digestion and absorption, Metabolism of carbohydrates, Proteins and fats, Diseases and conditions of the system.

4. **The Urinary System**
   a. Parts of urinary system
   b. Position, structure and functions
   c. Kidneys, ureters, urinary bladder and urethra
   d. Formation and composition of urine
   e. Water and electrolyte balance
   f. Diseases and conditions of the system

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5. **The Reproductive System:**

   a. Female reproductive system
      - External genitalia: positions and structures and functions, Perineum.
      - Internal organs: positions and structures
      - Vagina uterus, uterine tubes, ovaries.
      - Menstrual cycle stages, hormone control, ovulation.
      - Breasts (Mammary glands)
      - Changes: puberty in pregnancy, during lactation.

   b. **Male reproductive system:**
      - Scrotum, testis, epididymis: positions.
      - Spermatogenesis,
      - Spermatic Cords, seminal vesicles,
      - Ejaculatory ducts: position, structure & functions
      - Prostate gland: position
      - Functions of male reproductive system, puberty
      - Diseases of female and male reproductive system.

6. **The Endocrine system:**
   a. Endocrine glands:
   b. Pituitary and hypothalamus: Position and structure
   c. Thyroid gland, parathyroid glands
   d. Adrenal (supra renal) glands
   e. Pancreas: Position, types of cells
   f. Hormones: secretion, function and control, pineal gland
   g. Common terms and diseases related to the system

7. **The organs of sense:**
   a. Hearing and the ear.
   b. External, middle and inner ear
   c. Physiology of hearing and diseases of ear.
   d. Sight and the ere: position, structure, sclera, cornea, choroid, ciliary body.
   e. Iris, Iens, retina, optic nerves.
   f. Physiology of sight and diseases of the eye.

8. **Sense of smell:**
   a. Olfactory nerves, origins, distribution.
   b. Physiology of smell
   c. Sense of taste: tongue.

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9. **The nervous system**
   a. Neurons: Structure, types and properties.
   b. Central nervous system: neurons, neuralgia meninges.
   c. Ventricles of brain. CSF.
   d. Brain, spinal cord: structures, functions, peripheral nervous system.
   e. Spinal and cranial nerves: origin distribution and functions.
   f. Automatic nervous system.
   g. Sympathetic and para sympathetic: origin distribution and function.
   h. Common diseases of the system.

10. **The Skin**
   a. Structure of skin
   b. Epidermis, dermis
   c. Functions of skin
   d. Hypothermia
   e. Wound healing: primary and secondary diseases of skin.

11. **Cross-sectional anatomy related to Ultrasound, CT and MRI techniques.**

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Skill Paper - I) Human Anatomy & Physiology Part-II (Lab/Practical)

Credits – 02

Pathology

1. General Pathology Adaptations, Injury and Repair: Hyperplasia, Atrophy, Metaplasia, Necrosis and Apoptosis-Differences between apoptosis and necrosis.

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Skill Paper - 2) Modern Radiological & Imaging Equipment including Physics (Theory)

Credits – 04

1. Special equipment Portable and mobile x-ray units, dental x-ray machine, skull table mammographic device-Technical aspects of Mammography, Generator, x-ray tubes; Accessories; Resolution; Quality control; Application and role in medicine, digital radiographic equipment, digital subtraction techniques. Tomography; Body section radiography, basic principle and equipment, multi section tomography, various types of tomographic movements, Dual energy x-ray absorptionometry (DEXA). Stats can.

2. Computed radiography its principle, physics & equipment, Digital Radiography, Flat panel digital fluoroscopy and radiography system, Direct and indirect digital radiography and fluoroscopy systems, Digital radiography and computed radiography its advantages, disadvantages and applications.

3. Vascular Imaging Equipment; Introduction, historical developments, Principle, Scanned projection radiography, digital subtraction angiography, applications and definition of terms.

4. Picture archiving and communication system (PACS)

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Skill Paper - 3) Contrast and Special Radiography Procedures (Theory)

Credits – 04

1. Gastrointestinal Tract: Fluoroscopy, general considerations, responsibility of radiographers. Barium swallow. pharynx and oesophagus- Barium meal and follow through - Hypotonic duodenography - Small bowel enema.- Barium Enema routine projections for colon and rectum, colonic activators: double contrast studies; colostomy. Special techniques for specific disease to be examined. - Water soluble contrast media - e.g. gastrograffin studies.

2. Salivary glands: Routine technique, procedure - sialography.

3. Biliary system:

4.
   a. Plain film radiography. - Intravenous cholangiography.- Percutaneous cholangiography.
   b. Endoscopic retrograde cholangio-pancreatography (ERCP).–Operative cholangiography.
   c. Post-Operative Choangiography (T - tube Cholangiography).

5. Urinary system. Intravenous urography- Retrograde pyelography - Antegrade pyelography. Cystography and micturating cystouresthrography - Urethrography (ascending) - Renal puncture.

6. Female reproductive system: Hysterosalpingography.

7. Mammography: Mammography: Basic views, special views, wire localization. - Ductography.

8. Respiratory system: Bronchography: Awareness.

9. Central Nervous System: Myelography. - Cerebral studies. - Ventriculography.

10. Arthrography: Shoulder. Hip, Knee, Elbow

11. Venography Peripheral venography- Cerebral venography- Inferior and superior venocavography Relevant visceral phlebography.

12. Sinusography: Routine technique and procedure.

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13. Tomography: General principles. Estimation, selection of depth of layer. - Layer thickness required for different examination. Spacing oftarers. Fypes and advantages of various -movements. Choice of tomographic movement expostire factor. Sequentiat, horizontal and multi section tomography - Application of tomography to specific regions.

14. Macroradiography: General principles - Requirement - Equipment - Technique

15. Soft Tissue Radiography: High and low kilo voltage technique; differential filtration – Non-screen technique - simultaneous screen and non-screen technique-Multiple radiography – Uses of soft tissue radiography.

16. High kV Radiography: General principles-Relation to patient dose- Change in radiographic contrast. - Scatter elimination: beam collimation: grid ratio - Speed and type of grid movement Radiographic factor: application and uses.

17. Localization of foreign bodies: General location principles- Ingested; inhaled; inserted; embedded foreign bodies - Foreign bodies in eye- Preparation of the area to be investigated- Appropriate projection for all - Techniques to locate non-opaque foreign body.

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Skill Paper - 3) Contrast and Special Radiography Procedures (Lab/Practical)

Credits – 02

Practicals:

Positioning and imaging of all kinds of contrast & special radiographic procedures

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Non - Skill Paper - 4) Research Methodology and Biostatistics (Theory)

Credits – 03

The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Basic Concepts of Biostatistics
6. Types of Data
7. Research tools and Data collection methods
8. Sampling methods
9. Developing a research proposal

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Non - Skill Paper - 5) Medical Law and Ethics (Theory)

Credits – 03

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying. Analyzing, and attempting to resolve the ethical problems that arise in practice". Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

Few of the important and relevant topics that need to focus on are as follows:

1. Medical Ethics-Definition-Goal-Scope
2. Introduction to Code of conduct
3. Basic principles of medical Ethics-Confidentiality
4. Malpractice and negligence-Rational and irrational drug therapy
5. Autonomy and informed consent-Right of patients
6. Care of the terminally ill-Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records- Medico legal case and type-Records and document related to MLC-ownership of medical records-Confidentiality Privilege communication-Release of medical information-Unauthorized disclosure-retention of medical records-other various aspects.
9. Professional indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

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B. Voc. (Medical Imaging Technology)

SEMESTER-II

(Non - Skill Paper - 6) Environmental Studies (Theory)

Credits – 04

Unit 1:

Introduction to Environment, Multidisciplinary nature of environmental studies.
National level of Environmental Institutions,Environmentalists of India.
Ecosystem, Components of Ecosystem(Biotic and Abiotic components) and types of Ecosystem.
Structure and Functions of Ecosystem.
Forest Ecosystem, Aquatic Ecosystem (pond)
Food chain, Food web and Energy flow in Ecosystem.

Unit 2:

Natural Resources: Forest Resources, Uses and over exploitation, deforestation, timber extraction, mining, dams and their effects on forests.
Water Resources: uses and over exploitation of surface and ground water, floods and droughts.
Energy resources: Renewable and non renewable energy resources, use of alternate energy sources.
Biodiversity, levels of Biodiversity: genetic, species and ecosystem diversity.
Values of Biodiversity: Ecological , economic, social, ethical, aesthetic and optional value.
Threats to Biodiversity and Conservation of Biodiversity.

Unit 3:

Environmental Pollution and its types , causes, effects and controls of Air and Water Pollution.
Nuclear hazards and human health risks (one case study)
Climate change, Global warming, Ozone layer depletion, Acid rain and impacts on human communities and agriculture.
Effect of Fire-works.
Environmental Laws: Environmental protection law, Air (Prevention and control of Pollution)Act; Water (Prevention and Control of Pollution)Act, Wildlife protection act, Forest Conservation Act, Conservation on Biological Diversity(CBD)

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Unit 4:

Human Population and Growth and its impact on Environment.
Disaster management: Earthquakes, Cyclones and landslides
Environmental movements: Chipko, Silent Valley and Bishnois of Rajasthan
Environmental communications and public awareness, case studies (eg. CNG vehicles in Delhi).

Field work

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local pollution site-Urban/Rural/Induatrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi ridge, etc.

Note: **This curriculum is of Four Units is designed for Regular students of MANUU**

Reference Books:

1. Environmental Studies - from crisis to cure – by R. Rajagopalan (Third edition) Oxford University Press.
2.Text book of Environmental Studies for undergraduate courses (second edition) by Erach Bharucha

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मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University Under Ministry of Education, Government of India)
Accredited 'A+' grade by NAAC

SCHOOL OF SCIENCES

Department of Vocational Studies and Skill Development

Credits and Scheme of Examination (Session 2019 to 2021)
B. Voc. (Medical Imaging Technology)
SEMESTER- III

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					ExternalAssessment	Internal Assessment	ExternalAssessment	Internal Assessment	
1.	Skill Paper - 1	Clinical Radiography – Positioning Part-I (Theory)	BVMI301CCT	04	70	30	---	---	100
		Clinical Radiography – Positioning Part-I (Lab.)	BVMI301CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Clinical Radiography – Positioning Part-II (Theory)	BVMI302CCT	04	70	30	---	---	100
		Clinical Radiography – Positioning Part-II (Lab.)	BVMI302CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Newer Modalities Imaging Techniques Including Patient Care (Theory)	BVMI303CCT	04	70	30	---	---	100
		Newer Modalities Imaging Techniques Including Patient Care (Lab.)	BVMI303CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	Fundamentals of Microbiology (Theory)	BVMI304CCT	04	70	30	---	---	100
		Fundamentals of Microbiology (Lab.)	BVMI304CCP	02	---	---	35	15	50
5.	Non-Skill Paper - 5	Physics of Newer Imaging Modalities (Theory)	BVMI305CCT	04	70	30	---	---	100
		Physics of Newer Imaging Modalities (Lab.)	BVMI305CCP	02	---	---	35	15	50
		Total		**30**					**750**

Nodal Officer
B. Voc. Programme

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MAULANA AZAD NATIONAL URDU UNIVERSITY

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SCHOOL OF SCIENCES

Bachelor of Vocational Programme M.I.T. & M.L.T.

B. Voc Medical Imaging Technology

Semester-III (Total credits-30)

Year 2020-21

Component	Title of The Paper	Credits
Skill Paper - 1	Clinical Radiography – Positioning Part-I (Theory)	04
	Clinical Radiography – Positioning Part-I (Lab.)	02
Skill Paper - 2	Clinical Radiography – Positioning Part-II (Theory)	04
	Clinical Radiography – Positioning Part-II (Lab.)	02
Skill Paper - 3	Newer modalities, Imaging Techniques including patient care (Theory)	04
	Newer modalities, Imaging Techniques including patient care (Lab.)	02
Non Skill Paper - 4	Fundamentals of Microbiology (Theory)	04
	Fundamentals of Microbiology (Lab.)	02
Non Skill Paper - 5	Physics of Newer Imaging Modalities (Theory)	04
	Physics of Newer Imaging Modalities (Lab.)	02
	Total Credits	30

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Skill Paper-1(4 Credits)

Clinical Radiography-Positioning Part-I

1. Skeletal System:

   (a) Upper limb: Technique for hand, fingers, thumb, wrist joint carpal bones, forearm, elbow joint, radio ulnar joints and humerus supplementary techniques for the above. E.g. Carpal tunnel view, ulnar groove, head of the radius, supracondylar projections.

   (b) Lower limb: Technique for foot, toes, great toe, tarsal bones, calcaneum, ankle joint, lower leg, knee, patella & femur. Supplementary techniques: Stress view for torn ligaments,

- Subtalar joint and talo calcaneal joint.
- Inter condylar projection of the knee.
- Tibial tubercle.
- Length measurement technique.

c) Shoulder girdle and thorax: Technique for shoulder joint, scapular, clavicle, acromio clavicular joints, sternum, ribs, sterno-clavicular joint Supplementary projections and techniques.

- Recurrent dislocation of shoulder.
- Traumatic dislocation of shoulder.
- Cervical ribs.

d) Vertebral column: Technique for atlanto-occipital joint, cervical spine, cervico thoracic spine, thoracic spine, thoraco- lumber spine, lumbo sacral spine, sacrum and coccyx. Supplementary techniques to demonstrate:

- Scoliosis
- Kyphosis
- Spondylolisthesis
- disc lesion
- Union of spinal graft.

e) Pelvic girdle and hip region: Technique for whole pelvis. Ilium, ischium, pubic bones, sacro iliac joint, symphysis pubis, hip joint, acetabulum neck of femur, greater and lesser trochanter. Supplementary techniques-

- Congenital dislocation of hips
- Epiphysis of femur
- Lateral projections for hip joints to show femoral head and neck relationship

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f) Skeletal survey: Skeletal survey for metabolic bone disease, metastases, hormonal disorder, renal disorders.

g) Skull Basic projections for cranium, facial bones, nasal bones and mandible. Technique for

- Petrous temporal for mastoids. Internal auditory canal. - Accessory nasal sinuses'
- Tempero - mandibular joint. Orbits and optic foramen.. Zygomatic arches.
- Styloid process. - Pituitary fossa. - Jugular foramen.

2. Dental Radiography. Technique for intra oral full mouth. Occlusal projections.. Extra oral projections including orthopantomography.- Supplementary techniques.

3. Upper respiratory system- Technique for post nasal airways, larynx, trachea, thoracic inlet, Valsalva manoeuvre. - Phonation.

4. Lungs and Mediastinum: Technique for routine projections- Supplementary projections: Antero posterior, obliques, lordotic, apical projection, use of penetrated postero-anterior, projection. - Expiration technique. - Technique for pleural fluid levels and adhesioas.

5. Abdominal viscer- Technique for plain film examination. - Projection for acute abdomen patients. - Technique to demonstrate: Foreign bodies, Imperforate anus.

6. Radiography using mobile X-ray equipment- Radiography in the ward: Radiography in the specialized unit, such as: Intensive care unit, Coronary care, Neonatal unitRadiography in the operating theatre.

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Clinical Radiography-Positioning Part-I Lab(credits-2)

Radiographic positioning of all parts of the body

1. Special radiological equipment: Portable and mobile x-ray units, dental X-ray machine, skull table mammographic device - Technical aspects of Mammography, Hi High Tension Generators, X-ray tubes-their types and advancements; Accessories, Resolution; Quality control; Application and role in medicine, digital radiography equipment digital subtraction techniques. Tomography: Body section radiography, basic principle and equipment, multi section tomography, various types of tomographic movements, tomosynthesis, Stich radiography, Dual energy X-ray absorptionometry (DEXA) scan.
2. Computed radiography: its principle, physics & equipment. Digital Radiography. Flat panel digital fluoroscopy and radiography system. Direct and indirect digital radiography and fluoroscopy system.Digital radiography and Computed radiography its advantages, disadvantages and applications.
3. Vascular Imaging Equipment: Introduction, historical developments, Principle, Scanned projection radiography, digital subtraction angiography, applications and definition of terms,
4. Picture archiving and communication system (PACS)

Practicals
Demonstration of basic procedures in all modem modalities.

Contrast & Special Radiography Procedures

For each of the examination the points listed below should be included:

1. Review the anatomy of the area.
2. State the clinical indication for the examination.
3. State contra indication if any for the examination.
4. Describe the preparation of the patient including the pre medication if appropriate.
5. Specify the type and quantity of contrast agent used.
6. Describe the method of introduction of the contrast agent.
7. Describe the series of projections taken during the examination.
8. Indicate the timings of the radiographs in relation to the administration of contrast agent.
9. Outline the practical problems and the way in which they may be overcome.
10. Explain the choice of exposure factor.
11. Detail the measures that should be taken for radiation protection.
12. Explain the after care of the patient.

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Special radiographic procedures

1. Responsibility of Radiographer during Radiological Procedures.
2. Preparation of Patient for Different Procedures.
3. Contrast Media - Positive and Negative, Ionic & Non-Ionic
4. Adverse Reactions To Contrast Media and Patient Management
5. Emergency Drugs in the Radiology Department
6. Emergency Equipments in the Radiology Department
7. Aseptic technique
8. Indications, contraindications, basic techniques and relationship to other techniques of

the following special procedures

a. Gastrointestinal Tract:

- Fluoroscopy, general considerations, responsibility of radiographers
- Barium swallow, pharynx and oesophagus
- Barium meal and follow through
- Hypotonic duodenography

- Small bowel enema
- Barium Enema routine projections for colon and rectum, colonic activators; double contrast studies; colostomy. Special techniques for specific disease to be examined
- Water soluble contrast media - eg, gastrograftin studies

b. Salivary glands: Routine technique, procedure-sialography

c. Biliary system:

- Plain film radiography
- Inuavenous cholangiography
- Percutaneous cholangiography
- Endoscopic retrograde cholangio-pancreatography (ERCP)
- Operative cholangiography
- Post-Operative cholangiography (T-tube cholangiography)

d. Urinary system:

- Intravenous urography
- Retrograde pyelography
- Antegrade pyelography
- Cystography and micturating cystouresthrography
- Urethrography (ascending)
- Renal puncture

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Female reproductive system: Hysterosalpingography.

f. Mammography:
- Mammography: Basic views, special views, wire localization
- Ductography.

g. Respiratory system: Bronchography: Awareness.

h. Sinusography: Routine technique and procedure.

i. Tomography:

- General principles.
- Estimation, selection of depth of layer.
- Layer thickness required for different examination.
- Spacing of layers
- Types and advantages of various movements.
- Choice of tomographic movement- exposure factor.
- Sequential, horizontal and mult section tomography
- Application of tomography to specific regions

J. Macroradiography:

- General principles
- Requirement
- Equipment
- Technique

K. Soft Tissue Radiography

- High and low kilo voltage technique; differential filtration.
- Non – screen technique – simultaneous screen and non – screen technique.
- Multiple radiography.
- Uses of soft tissue radiography.

1. **High kV Radiography:**

- General principles
- Relation to patient dose
- Change in radiographic contrast.
- Scatter elimination; beam collimation; grid ratio
- Speed and type of grid movement
- Radiographic factor; application and uses.

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m. Localization of foreign bodies:

- General location principles,
- Ingested; inhaled; inserted; embedded foreign bodies
- Foreign bodies in eye.
- Preparation of the area to be investigated.
- Appropriate projection for all
- Techniques to locate non-opaque foreign body

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Skill Paper-2(credits-4)

Clinical Radiography Positioning Part-2

1. Radiography technique comprising of the complete.
2. Radiography of Skull and Radiography of cranial bones: including special techniques for sella turcica, orbits, opticforamina, superior orbital fissure and inferior orbital fissure etc.
3. Facial bones: Paranasal sinuses. Temporal bone and Mastoids.
4. Dental Radiography: Radiography of teeth-intra oral, extra oral and occlusal view.
5. Abdomen: Preparation of patient. General abdominal radiography and positioning for fluid and air levels. Plain film examination. Radiography of female abdomen to look for pregnancy. Radiography in case of acute abdomen.
6. Macroradiography: Principle, advantage, technique and applications.
7. Stereography – Procedure – presentation, for viewing, stereoscopes, stereometry.
8. High KV techniques principle and its applications.
9. Soft tissue Radiography including Mammography – its techniques, equipment, advancements and application.
10. Localization of foreign bodies. Various techniques
11. Ward / mobile radiography – electrical supply, radiation protection, equipment and instructions to be followed for portable/ ward radiography.
12. Operation theatre techniques: General precautions, Asepsis in techniques – Checking of mains supply and functions of equipment, selections of exposure factors, explosion risk, radiation protection and rapid processing techniques.
13. Trauma radiography/Emergency radiography
14. Neonatal and Paediatric Radiography
15. Tomography and Tomosynthesis
16. Dual energy X-ray absorptiometry
17. Forensic Radiography

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Skill paper 3(credits-4)

Newer Imaging Techniques including Patient Care

1. Interventional Radiography:
   Basic angiography and DSA:
   a. History, technique, patient care
   b. Percutaneous catherisation, catheterization sites, Asepsis
   c. Guidewire, catheters, pressure injectors, accessories
   d. Use of digital substraction-single plane and bi-plane

   All forms of diagnostic procedures including angiography, angioplasty, bilary examination, renal evaluation and drainage procedure.

2. Central Nervous System:
   a. Myelography
   b. Cerebral studies
   c. Ventriculography
3. Arthrography: Shoulder, Hip, Knee, Elbow
4. Angiography:
   a. Carotid Angiography (4 Vessel angiography)
   b. Thoracic and Arch Aortography
   c. Selective studies: Renal, SMA, Coeliac axis
   d. Vertebral angiography
   e. Femoral arteriography
   f. Angiocardiography
5. Venography:
   a. Peripheral venography
   b. Cerebral venography
   c. Inferior and superior venocavography
   d. Relevant visceral phlebography
6. Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, Electrophyiology,

Microbiology

1. Introduction and morphology-Introduction of microbiology, Classification of microorganism, size, shape and structure of bacteria. Use microscope in the study of bacteria.
2. Growth and nutrition-nutrition, culture media, type of medium with example and uses of culture media in diagnostic bacteriology, antimicrobial sensitivity test.
3. Sterilization and disinfection-principles and use of equipments of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, anti-septic and disinfectants.
4. Introduction to immunology, bacteriology, parasitology, mycology

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...aging Department

Patient management is based on team work, it is essential that the student should appreciate the technologist's role and that the importance of co-operation with wards and other departments. The students should be attached to wards or the accidents and emergency department for a definite training period.

1. Hospital procedure: Hospital staffing and organization; records relating to patients and departmental statistics; professional attitude of the technologists to patients and other members of the staff; medico-legal aspects; accidents in the departments, appointments, organization; minimizing waiting time; out-patient and follow-up clinics; stock-taking and stock keeping.

2. Care of the patient: FIRST contact with patients in the department; management of chair and stretcher patients and aids for this, management of the unconscious patient; elementary hygiene; personal cleanliness; hygiene in relation to patients (for example clean linen and receptacles, nursing care; temperature pulse and respiration; essential care of the patient who has a tracheostomy; essential care of the patient who has a colostomy; bedpans and urinals; simple application of a sterile dressing.

3. First aid: Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction apparatus, drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; hemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies; poisons.

4. Infection: Bacteria, their nature and appearance; spread of infections; auto-infection or cross-infection; the inflammatory process; local tissue reaction, general body reaction; ulceration; asepsis and antisepsis. Universal precautions, hospital acquired infections- HIV, Hepatitis B, C, and MRSA etc.

5. Principles of asepsis: Sterilization – methods of sterilization; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filamented swabs, elementary operating theatre procedure; setting of trays and trolleys in the radio imaging department (for study b radio imaging students only).

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Departmental procedures: Department staffing and organizations; records relating to patients and departmental statistics; professional attitudes of the technologist to patients and other members of the staff, medico-legal aspects accidents in the department;

Appointments; organisations; minimizing waiting time; out patient and follow-up clinics; stock taking and stock keeping.

7. Drugs in the department: Storage; classification; labeling and checking, regulations regarding dangerous and other drugs; units of measurement, special drugs, anti-depressive, anti-hypertensive etc.

Quality Control in Radiology and Radiation Safety

1. Objectives of quality Control: Improve the quality of imaging thereby increasing the diagnostic value; to reduce the radiation exposure; Reduction of film wastage and repeat examination; to maintain the various diagnostic and imaging units at their optimal performance.

2. Quality assurance activities: Equipment selection phase; Equipment installation and acceptance phase; Operational phase; Preventive maintenance.

3. Quality assurance programme at the radiological faculty level: Responsibility, Purchase; Specifications; Acceptance; Routine testing; Evaluation of results of routine testing, Quality assurance practical exercise in the X ray generator and tube; Image receptors from processing; Radiographic equipment; Fluoroscopic equipment; Mammographic equipment; Conventional tomography; Computed tomography; Film processing, manual and automatic; Consideration for storage of film and chemicals; Faults tracing: Accuracy of imaging-image distortion for digital imaging devices. LASER printer calibration

4. Quality assurance programme tests: General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually - machine calibration. Basic concepts of quality assurance - LASER printer - Light beam alignment; X-ray out-put and beam quality check; KVp check; Focal spot size and angle measurement; Timer check; mAs test; Grid alignment test; High and low contrast resolutions; Mechanical and electrical checks; Cassette leak check; Proper screen-film contact test; Safe light test; Radiation proof test; Field alignment test for fluoroscopic device; Resolution test; Phantom measurements - CT, US and MRI.

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5. Quality assurance of film and image recording devices: Sensitometry; Characteristic curve; Film latitude; Film contrast; Film speed Resolution; Distortion; Artifacts of films and image recording. Monitor calibration. SMPTE pattern

6. Maintenance and care of equipment: Safe operation of equipment; Routine cleaning of equipment and instruments; Cassette, screen maintenance; Maintenance of automatic processor and manual processing units; Routine maintenance of equipments; Record keeping and log book maintenance; Reject analysis and objectives of reject analysis programme.

7. Care and maintenance of diagnostic equipment: General principles and preventive
maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment

Radiation safety in diagnostic Radiology

1. Radiation Quantities and Units: Radiation- Radioactivity- Sources of radiation – natural radioactive sources -cosmic rays terrestrial radiation -- man made radiation sources. Units of radiation - Quality factor - Flux- Fluence-Kerma-Exposure - Absorbed dose Equivalent Dose-Weighting Factors-Effective Dose - Occupational Exposure Limits - Dose limits to public.

2. Biological Effects of radiation: Ionization, excitation and free radical formation, hydrolysis of water, action of radiation on cell-Chromosomal aberration and its application for the biological dosimetry-Effects of whole body and acute irradiation, dose fractionation, effects of ionizing radiation on each of major organ system including fetus-Somatic effects and hereditary effects-stochastic and deterministic effects-Acute exposure and chronic exposure-LD50 - factors affecting radio sensitivity. Biological effects of non-ionizing radiation like ultrasound, lasers, IR, UV and magnetic fields.

3. Radiation detection and Measurements: Ionization of gases- Fluorescence and Phosphorescence -Effects on photographic emulsion. Ionization Chambers - proportional counters- G.M counters- scintillation detectors - liquid semiconductor detectors - Gamma ray spectrometer. Measuring systems - free air ionization chamber - thimble ion chamber - condenser chamber - Secondary standard dosimeters -- film dosimeter - chemical dosimeter-Thermoluminescent Dosimeter. -Pocket dosimeter Radiation survey meter-wide range survey meter-zone monitor-contamination monitor - their principle function and uses. Advantages & disadvantages of various detectors & its annropriateness of different detectors for different type of radiation measurement. Dose and Dosimetry, CT Dose Index (CTDI, etc.), Multiple Scan Average Dose (MSAD). Dose Length Product (DLP), Dose Profile, Effective Dose, Phantom Measurem Methods, Dose for Different Application

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Protocols, Technique Optimization. Dose area product in fluoroscopy and angiography systems, AGD in mammography.

4. Radiation protection: Radiation protection of self and patient- Principles of radiation protection, time - distance and shielding, shielding - calculation and radiation survey - ALARA- personnel dosimeters (TLD and film batches) - occupational exposure.

5. Radiation Hazard evaluation and control: Philosophy of Radiation protection effect of time. Distance & Shielding. Calculation of Work load, weekly calculated dose to radiation worker & General public Good work practice in Diagnostic Radiology. Planning consideration for radiology, including Use factor, occupancy factors, and different shielding material

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General Paper-4(credits-4)

Fundamental of Microbiology

Course Code	Title	Credits	NOS
	Fundamental of Microbiology	**04**	
Unit-I	**Introductory Microbiology**		
	History, development, scope and applications of Microbiology. Methods of Microbiology isolation of pure cultures, theory and practice of sterilization. Microscopic examination of micro-organism, bright field microscopy, dark field microscopy, phase contrast microscopy, electron microscopy. Staining of microbes, teory of Gram staining. Nature of Microbial Worl:Prokaryotes and eukaryotes, growth pattern in microbes.		
Unit-II	**Morphology and Structure of Microorganisms**		
	Morphology and fine structure of bacteria, fungi, actinomycete and alge. Organization of cell wall, cell membrane, flagella and capsules in bacteria. Morphogenesis in bacteria, formation of spores and cysts. Animal Viruses: Morphology, cultivation and viral disease cycle. Bacteriophages : Morphology, multiplication, detection and enumeration. Biotransformatiion of (a) D-Sorbitol to L-Sorbose. (b) antibiotics. (c) Steroids.		
Unit-III	**Recombinant DNA Technology**		
	Recombinant DNS Technology, genetic engineering and gene cloning in micro organisms. Strategies of genetic engineering. Restriction enzymes, vectors, plasmids. Genetic engineering for human welfare : (a) Production of pharmaceuticals. (b) insect pest control, (c) Use of Genetically Engineered Micro-organisms (GEMs) for control of pollution.		

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	Microbial Ecology and Biotic Interactions		
Unit-IV	Rhizosphere & Rhizoplane micro-organisms, reasons for increased microbial activity in rhizosphere. Biogeochemical Cycling-Carbon cycle, Nitrogen cycle Phosphorus & Sulphur cycle. Symbiotic & non-symbiotic Nitrogen fixation biofertilisers & biopesticides. Sewage (waste+water) treatment, chemical characteristics, microbiological characteristics, waste treatment processes.		

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Fundamentals of Microbiology-Lab(credits-2)

Course Code	Title	Credits	NOS
		02	
1.	Use of microscope in examination of unstained bacteria, fungi, algae, parasites and stained cell preparations including simple staining, Gram's staining, acid fast staining, capsule staining, spore staining using prokaryotic and eukaryotic cells, hanging drop preparation.		
2.	Preparation of culture media, spread plates, pour plates, selective media, differential media.		
3.	Separation of pure cultures and study the effect of selective nutrients on prokaryotes.		
4.	Isolation of Soil Bacteria, Soil Fungi, Soil Actinomycets		
5.	Selective media for Soil microflora and use of growth factors, Study of Rhizosphere interaction, Quantitative measurements of Soil nutrients and Rhizosphere microflora and preparation of starter cultures of Rhizobia, Azotobacter.		

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General Paper-5(credits-4)

Physics of Newer Imaging Modalities

1. Computed Tomography its principle, various generations and advancements.
2. Magnetic Resonance Imaging- its principle, advancements and applications.
3. Ultrasonography, Color Doppler- its principle, advancements and applications.
4. Digital Radiography and Digital subtraction angiography equipment- principle, advancements and applications.
5. Fusion Imaging including PET-CT, PET-MRI.
6. Digital Mammography, DEXA equipment- principle, advancements and applications.
7. Tele radiology HIS, RIS and PACS,

Image processing in digital radiography systems: Post processing techniques in console using CR, DR and flat panel fluoroscopy systems

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मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University Under Ministry of Education, Government of India)
Accredited 'A+' grade by NAAC

SCHOOL OF SCIENCES

Department of Vocational Studies and Skill Development

Credits and Scheme of Examination (Session 2019 to 2021)
B. Voc. (Medical Imaging Technology)
SEMESTER- IV

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					ExternalAssessment	Internal Assessment	ExternalAssessment	Internal Assessment	
1.	Skill Paper - 1	Physics of Advanced Imaging Technology (Theory)	BVMI401CCT	04	70	30	---	---	100
		Physics of Advanced Imaging Technology (Lab.)	BVMI401CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Quality Control in Radiology and Radiation Safety(Theory)	BVMI402CCT	04	70	30	---	---	100
		Quality Control in Radiology and Radiation Safety (Lab.)	BVMI402CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Cross Sectional Anatomy and Physiology (Theory)	BVMI403CCT	04	70	30	---	---	100
		Cross Sectional Anatomy and Physiology (Lab.)	BVMI403CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	Electronic Devices and Circuits (Theory)	BVMI404CCT	04	70	30	---	---	100
		Electronic Devices and Circuits (Lab.)	BVMI404CCP	02	---	---	35	15	50
5.	Non-Skill Paper - 5	Electronic Measurements And Instrumentation(Theory)	BVMI405CCT	04	70	30	---	---	100
		Electronic Measurements And Instrumentation (Lab.)	BVMI405CCP	02	---	---	35	15	50
		Total		**30**					**750**

Nodal Officer
B. Voc. Programme

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SCHOOL OF SCIENCES
Bachelor of Vocational Programme M.I.T. & M.L.T.

B. VOC. (MEDICAL IMAGING TECHNOLOGY)
IV - SEMESTER (SYLLABUS)

Component	Title of The Paper	Credits
Skill Paper - 1	Physics of Advanced Imaging Technology (Theory)	04
	Physics of Advanced Imaging Technology (Lab.)	02
Skill Paper - 2	Quality Control in Radiology and Radiation Safety(Theory)	04
	Quality Control in Radiology and Radiation Safety (Lab.)	02
Skill Paper - 3	Cross Sectional Anatomy and Physiology (Theory)	04
	Cross Sectional Anatomy and Physiology (Lab.)	02
Non Skill Paper - 4	Electronic Devices and Circuits (Theory)	04
	Electronic Devices and Circuits (Lab.)	02
Non Skill Paper - 5	Electronic Measurements And Instrumentation(Theory)	04
	Electronic Measurements And Instrumentation (Lab.)	02
	Total Credits	**30**

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B. Voc. (Medical Imaging Technology)

SEMESTER-IV

(Skill Paper - I) Physics of Advanced Imaging Technology (Theory)

Credits – 04

1. **Basic Computed Tomography-** Basic principles of CT, generations of CT, CT instrumentation, image formation in CT, CT image reconstruction, Hounsfield unit, CT image quality. CT image display

2. **Advanced Computed Tomography**

   Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone - beam geometry, reconstruction of helical CT images, CT artefact, CT angiography, CT fluoroscopy. HRCT, post processing techniques MPR. MIP. Min IP. 3D rendering SSD and VR, CT Dose, patient preparation, Imaging techniques and protocols for various parts of body, CT contrast enhanced protocols - CT angiography - (Aortogram, selective angiogram head, neck and peripheral) image documentation and Filing, maintenance of equipment and accessories.

3. **Advanced technique & instrumentation of MRI**

   a. Basic Principles Spin - precession-relaxation time -pulse cycle – T1 weighted image - T2 weighted image-proton density image.

   b. Pulse sequence: Spin echo pulse sequence - turbo spin echo pulse sequence Gradient echo sequence - Turbo gradient echo pulse sequence - Inversion recovery sequence - STIR sequence - SPIR sequence -- FLAIR sequence - Echo planar imaging - Advanced pulse sequences.

   C. MR Instrumentation: Types of magnets - RF transmitter - RF receiver – Gradient coils - shim coils - RF shielding - computers.

   D. Image formation: 2D Fourier transformation method - K-space representation - 3D Fourier imaging - MIP.

   E. MR contrast media - MR angiography - TOF & PCA - MR Spectroscopy - functional MRI

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4. Ultrasonography

A. Basic Acoustics, Ultrasound terminologies: acoustic pressure, power, intensity, impedance, speed, frequency, dB notation: relative acoustic pressure and relative acoustic intensity

B. Interaction of US with matter reflection, transmission, scattering, refraction and
absorption, attenuation and attenuation coefficients, US machine controls, US focusing

C. Production of ultrasound: Piezoelectricity, Medical ultrasound transducer: Principle, construction and working, characteristics of US beam.

D. Ultrasound display modes: A, B, M

E. Real-time ultrasound: Line density and frame rate, Real-time ultrasound transducers: mechanical and electronic arrays, ultrasound artifacts, ultrasound recording devices, and Distance, area & volume measurements.

F. Techniques for imaging different anatomic areas, ultrasound artifacts, biological effects and safety.

G. Doppler Ultrasound- Patient preparation for Doppler, Doppler artifacts, vascular sonography,

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B. Voc. (Medical Imaging Technology)

SEMESTER-IV

(Skill Paper - 2) Quality Control in Radiology and Radiation Safety (Theory)

Credits – 04

1. Objectives of quality Control Improve the quality of imaging thereby increasing the diagnostic value to reduce the radiation exposure. Reduction of film westage and respect examination to maintain the various diagnostic and imaging units at their optimal performance
2. Quality assurance activities Equipment selection phase; Equipment installation and acceptance phase Operational phase, Preventive maintenance
3. Quality assurance programme at the radiological faculty level Responsibility: Purchase Specifications Acceptance Routine testing Evaluation of results of continue testing Quality assurance practical exercise in the X ray generator and tube, image receptors from processing Radiography equipment: Fluoroscopic Equipment: Mammographic equipment : Conventional tomography Computed tomography, film processing manual , and automatic Consideration for storage of film and chemicals Faults tracing Accuracy of imaging image distortion for digital imaging devices LASER printer calibration
4. Quality assurance programme test General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually machine calibration basic concepts of quality assurance -LASER printer - Light beam alignment: X-ray output and beam quality check: KVp check: Focal spot size and angle measurement: Timer checks mas Test Grid alignment test High and low contrast resolutions: Mechanical and electrical checks Cassette leak check, Proper screen film contact test Safe light test: Radiation proof test: Field alignment test for fluoroscopic device Resolution test, Phantom measurements - CT, US and MRI.
5. Quality assurance of film and image recording devices Sensitometer: Characteristic curve: Film latitude: Film contrast: Film speed Resolution: Distortion; Artifacts of films and image recording, Monitor calibration SMPTE pattern
6. Maintenance and care of equipment Safe operation of equipment Routine cleaning of equipment and instruments; Cassette, screen maintenance, Maintenance of automatic processor and manual processing units, Routine maintenance of equipments, Record keeping and log book maintenance Reject analysis and objectives of reject analysis programme.
7. Care and maintenance of diagnostic equipment General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually care in use, special care of mobile equipment.

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B. Voc. (Medical Imaging Technology)

SEMESTER-IV

(Skill Paper - 3) Cross Sectional Anatomy and Physiology (Theory)

Credits – 04

Radiology has been developing dramatically during the past few years. With enhancements in magnetic resonance imaging (MRI) and computed tomography (CT), the role of the radiologic technologist has also been changing.

Skills in cross-sectional anatomy are important to help the technologist in MRI and CT to identify the anatomy being imaged and to communicate effectively with the radiologist and physicians.

At the completion of this, candidates will be able to:

1. Identify cross-sectional anatomy in the sagittal, coronal and axial planes on CT and MR Images.
2. Describe anatomical structural relationships
3. Recognize nomal anatomy and build personal resource system for future study
4. Locate and identify pertinent cerebral, upper thorax, mid-thorax, and abdominal anatomy
5. On CT and MR images, Identity anatomical structures of the body and of the head
6. Distinguish between arterial and venous anatomy of the entire body's vascular system
7. Classify the various sections of anatomical regions and their associated parts

The students will be given a thorough understanding of:

1. Introduction to Sectional Anatomy & Terminology - Sectional planes, Anatomical relationships/terminology
2. Anatomy of the upper thorax-Surface anatomy relationships. Bony structures and muscles, Blood vessels.
3. Divisions of the mid-thorax, heart and great vessels-Lungs, heart and great vessels, Esophagus
4. CT/MRI Images of the Thorax - Normal and pathologies
5. Anatomy of the Abdomen-Major organs and their accessories, Abdominal blood vessels
6. CT/MR Images of Abdomen - Normal and pathologic
7. Anatomy of the Pelvis-Bony structures and associated muscles, Digestive and unary systems
8. Reproductive Organs
9. CT/MR Images of the Male/Female Pelvis- Normal und pathologic

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10. Neuro Anatomy Scan planes
11. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts Arterial/venous systems, Basal ganglia, Canal nerves
12. Spine-Vertebra and disc, Spinal cord and meanings
    Neck- Arterial/venous systems, Muscles, Glands and pharyn

B. Voc. (Medical Imaging Technology)

SEMESTER-IV

(Non - Skill Paper - 4) Electronic Devices And Circuits (Theory)

Credits – 04

UNIT-I: PN DIODES

Introduction on semiconductors, P and N-type semiconductors, PN Junction diode, Depletion region, Barrier potential, working in Forward and Reverse bias condition – Junction capacitance, diode current equation – Effect of temperature on reverse saturation current – construction, working, V-I characteristics and simple applications of Varactor diode, Zener diode and Tunnel diode.

UNIT-II: BJT & FET

BJT Introduction, Construction, Operation and Characteristics of CB, CE and CC – Configurations, Transistor as a switch. Fixed bias circuit, Emitter-stabilized bias circuit, Voltage Divider Bias, Bias stabilization.

UNIT-III: UJT, SCR & PHOTO DEVICES

UJT construction and working, V-I characteristics, UJT as a Relaxation Oscillator.

SCR construction and working, Two transistor representation, Characteristics of SCR, Applications of SCR for power control.

PHOTO DEVICES Light-Emitting Diodes (LEDs), IR Emitters, Photo diode, Photo transistors, Structure and operation of LDR and Opto-Isolators.

UNIT-IV: POWER SUPPLIES

Half wave, Full wave and Bridge rectifiers – Efficiency – Ripple factor – Regulations, Types of filters – Choke input filter, shunt, L-section and Pi-section filters. Three terminal fixed voltage I.C. regulators (78XX and 79XX)- Principle and working of SMPS (Switch Mode Power Supply).

Text Books

1. Electronic Devices and Circuit Theory – Robert L. Boylestad & Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd – PHI Fifth Edition.

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B. Voc. (Medical Imaging Technology)

SEMESTER-IV

(Non - Skill Paper - 4) Electronic Devices And Circuits (Lab/Practical)

Credits – 04

ELECTRONIC DEVICES AND CIRCUITS LAB

1. V-I Characteristics of Junction Diode.
2. V-I Characteristics of Zener Diode.
3. Regulated Power Supply using Zener Diode.
4. BJT input and output characteristics.
5. FET input and output characteristics.
6. UJT Characteristics.
7. LDR Characteristics.
8. V-I Characteristics of SCR.
9. IC Regulated Power Supply (7805).

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B. Voc. (Medical Imaging Technology)

SEMESTER-IV

(Non - Skill Paper - 5) Electronic Measurements And Instrumentation (Theory)

Credits – 04

UNIT-I:

Block Schematics of Measuring Systems Performance characteristics, static characteristics, Accuracy, Precision, Resolution, Types of Errors, Dynamic characteristics Repeatability, Reproducibility, Fidelity, Lag;

Measuring Instruments DC Voltmeters and Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter protection, extension of range, true RMS Responding Voltmeters, Specifications of instruments.

UNIT-II:

DC & AC Bridges Wheat Stone Bridge, Kelvin Bridge and Maxwell Bridge.

Signal Analyzers AF, HF Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Capacitance-Voltage Meters.

Signal Generators AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator.

UNIT-III:

Oscilloscopes CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO probes, High Frequency CRO considerations, Delay lines, Measurement of Time, Period and Frequency using CRO.

Special Purpose Oscilloscopes Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT-IV:

Transducers Stain Gauges, Bounded, Unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Piezoelectric Transducers, Magnetostrictive Transducers.

Measurement of Physical Parameters Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture velocity, Pressure – High Pressure Vacuum level, Temperature-Measurements, Data Acquisition Systems.

Text Books:

1. Electronic Instrumentation H.S.Kalsi – TMH, 2nd Edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques A D Helbincs, W.D.Cooper, PHI, 5th Edition 2003.

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मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

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Accredited 'A+' grade by NAAC

SCHOOL OF SCIENCES

Department of Vocational Studies and Skill Development

Credits and Scheme of Examination (Session 2019 to 2021)
B. Voc. (Medical Imaging Technology)
SEMESTER- V

S. No.	Component	Title of The Paper	Paper Code	Credits	Marks (Theory)		Marks (Practical)		Total
					ExternalAssessment	Internal Assessment	ExternalAssessment	Internal Assessment	
1.	Skill Paper - 1	Nuclear Medicine (Theory)	BVMI501CCT	04	70	30	---	---	100
		Nuclear Medicine (Lab.)	BVMI501CCP	02	---	---	35	15	50
2.	Skill Paper - 2	Advance Medical Procedure (Theory)	BVMI502CCT	04	70	30	---	---	100
		Advance Medical Procedure (Lab.)	BVMI502CCP	02	---	---	35	15	50
3.	Skill Paper - 3	Patient Care In medical Imaging department (Theory)	BVMI503CCT	04	70	30	---	---	100
		Patient Care In medical Imaging department (Lab.)	BVMI503CCP	02	---	---	35	15	50
4.	Non-Skill Paper - 4	Regulatory Requirements in Diagnostic Radiology & Imaging, Act and rules, regulations for JCI, NABH (Theory)	BVMI504CCT	04	70	30	---	---	100
		Regulatory Requirements in Diagnostic Radiology & Imaging, Act and rules, regulations for JCI, NABH (Lab.)	BVMI504CCP	02	---	---	35	15	50
5.	Non-Skill Paper - 5	Admin, Medico Legal and Interventional Procedure (Theory)	BVMI505CCT	04	70	30	---	---	100
		Admin, Medico Legal and Interventional Procedure (Lab.)	BVMI505CCP	02	---	---	35	15	50
		Total		**30**					**750**

Nodal Officer
B. Voc. Programme

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SCHOOL OF SCIENCES
Bachelor of Vocational Programme M.I.T. & M.L.T.

B. VOC. (MEDICAL IMAGING TECHNOLOGY)
V - SEMESTER (SYLLABUS)

Component	Title of The Paper	Credits
Skill Paper – 1	Nuclear Medicine (Theory)	04
	Nuclear Medicine (Lab.)	02
Skill Paper – 2	Advance Medical Procedure (Theory)	04
	Advance Medical Procedure (Lab.)	02
Skill Paper – 3	Patient Care In medical Imaging department (Theory)	04
	Patient Care In medical Imaging department (Lab.)	02
Non-Skill Paper – 4	Regulatory Requirements in Diagnostic Radiology & Imaging, Act and rules, regulations for JCI, NABH,, NABHR. (Theory)	04
	Regulatory Requirements in Diagnostic Radiology & Imaging, Act and rules, regulations for JCI, NABH,, NABHR. (Lab.)	02
Non-Skill Paper – 5	Admin, Medico Legal and Interventional Procedure (Theory)	04
	Admin, Medico Legal and Interventional Procedure (Lab.)	02
	Total Credits	**30**

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B. Voc. (Medical Imaging Technology)

SEMESTER-V

(Skill Paper - 1) Nuclear Medicine (Theory)

Credits – 04

Unit I Nuclear Medicine Instrumentation- Part II

Gamma Camera: Basic principles of gamma camera, collimators - parallel hole, divergent, pinhole, fan beam, slant hole collimator. Gamma camera-computer interface- ADC/DAC. Criteria of installation of Gamma camera. Selection of gamma camera - specifications and other aspects.

Unit II –SPECT: image reconstruction techniques, filters, artefacts in SPECT (attenuation correction, non-uniformity corrections, correction with combined SPECT-CT system), effect of scatter & scatter correction, partial volume effects, multi detector SPECT, coincidence, SPECT acquisition - step & shoot/continuous. SPECT v/s planar camera, SPECT v/s other modalities (CT, MRI, Ultrasonography}

Unit III –PET: Historical developmental of Functional In Vivo Studies Using Positron, Physics and instrumentation in PET, Data acquisition and Performance Characterization in PET, Image reconstruction Algorithm in PET, Quantitative techniques in PET, Tracer Kinetic Modeling in PET, Co-registration of Structural and Functional images, Radiation Dosimetry and Protection in PET

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B. Voc. (Medical Imaging Technology)

SEMESTER-V

(Skill Paper - 2) Advance Medical Procedure (Theory)

Credits – 04

1. Central Nervous System: Myelography, Cerebral studies, Ventriculography
2. Arthrography: Shoulder, Hip, Knee, Elbow
3. Angiography: Carotid Angiography (4 Vessel angiography), Thoracic and Arch Aortography, Selective studies: Renal, SMA, Coeliac axis, Vertebral angiography Femoral arteriography, Angiocardiography
4. Venography: Peripheral venography, Cerebral venography, Inferior and superior venocavography, Relevant visceral phlebography
5. Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, Electrophyiology
6. Gynaecology: Hysterosalpingography
7. Biliary system: Plain film radiography, Intravenous cholangiography, percutaneous cholangiography, Endoscopic retrograde cholangio-pancreatography. (ERCP), Operative cholangiography, Post-Operative cholangiography (T-tube Cholangiography)
8. Gastrointestinal tract: Barium meal, Barium swallow, Small bowel enema, Barium enema.
9. Renal tract: Intravenous urography, retrograqe pyelography, micturating cystourethrography
10. Other : Sialography.

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B. Voc. (Medical Imaging Technology)

SEMESTER-V

(Skill Paper - 3) Patient Care In medical Imaging department (Theory)

Credits – 04

1. Hospital procedure: Hospital staffing and organization; records relating to patients and departmental statistics; professional attitude of the technologist to patients and other members of the staff; medico- legal aspects; accidents in the departments, appointments, organization; minimizing waiting time; out-patient and follow-up clinics; stock-taking and stock keeping.

2. Care of the patient : FIRST contact with patients in the department; management of chair and stretcher patients and aids for this, management of the unconscious patient; elementary hygiene; personal cleanliness; hygiene in relation to patients (for example clean linen and receptacles , nursing care; temperature pulse and respiration; essential care of the patient who has a tracheostomy; essential care of the patient who has a colostomy; bedpans and urinals; simple application of a sterile dressing.

3. First aid: Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction apparatus, drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; hemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies; poisons.

4. Infection: Bacteria, their nature and appearance; spread of infections; auto-infection or cross-infection; the inflammatory process; local tissue reaction, general body reaction; ulceration; asepsis and antisepsis. Universal precautions, hospital acquired infectionsHIV, Hepatitis B, C, and MRSA etc.

5. Principles of asepsis: Sterilization - methods of sterilization; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filamented swabs, elementary operating theatre procedure; setting of trays and trolleys in the radio imaging department (for study by radio imaging students only)

6. Departmental procedures: Department staffing and organisations; records relating to patients and departmental statistics; professional attitudes of the technologist to patients and other members of the staff, medico-legal aspects accidents in the department; appointments; organisations; minimizing waiting time; out-patient and follow-up clinics; stock taking and stock keeping.

7. **Drugs in the department: Storage:** classification; labelling and checking, regulations regarding dangerous and other drugs; units of measurement, special drugs, antidepressive, anti-hypertensive etc.

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B. Voc. (Medical Imaging Technology)

SEMESTER-V

(Non-Skill Paper - 4) Regulatory Requirements in Diagnostic Radiology & Imaging, (Theory)

Credits – 04

1. **Regulatory Bodies & regulatory Requirements:** International Commission on Radiation Protection (ICRP) / National Regularity body (AERB - Atomic Energy Regulatory Board) -Responsibilities, organization, Safety Standard, Codes and Guides, Responsibilities of licenses, registrants & employers and Enforcement of Regulatory requirements.

2. **Role of Radiographer in Planning, QA & Radiation Protection:** Role of technologist in radiology department - Personnel and area monitoring., Setting up of a new X-Ray unit, staff requirement, AERB specifications for site planning and mandatory guidelines – Planning of X-ray rooms, dark rooms – Inspection of X-Ray installations - Registration of X-Ray equipment installation- Certification -Evaluation of workload versus radiation factors – Occupational exposure and protection Tools/devices. ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection. NABH guidelines, AERB guidelines, PNDT Act and guidelines

BMRIT Directed Clinical Education – part IV (studentship)

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior technologist. Students are tested on intermediate clinical radio diagnosis skills.

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B. Voc. (Medical Imaging Technology)

SEMESTER-V

(Non-Skill Paper - 5) Admin, Medico Legal and Interventional Procedure (Theory)

Credits – 04

1. Principals of Management: Introduction to management, Strategic Management, Foundations of Planning, Planning Tools and Techniques, Decision Making, conflict and stress management, Managing Change and Innovation, Understanding Groups and Teams, Leadership, Time Management, Cost and efficiency.

2. Medical law and ethics: Medical ethics; Definition, Goal, Scope; Introduction to Code of conduct; Basic principles of medical ethics - Confidentiality; Malpractice and negligence; Autonomy and informed consent - Right of patients; Care of the terminally ill-Euthanasia ; Organ transplantation; Medico legal aspects of medical records - Medico legal case and type-Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects; Professional Indemnity insurance policy; Development of standardized protocol to avoid near miss or sentinel events; Obtaining an informed consent

3. Quality and patient safety: Quality assurance; Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools, Introduction to NABH guidelines; AERB specifications, radiation safety (lead glass equivalence, lead lined doors), room size, type approval, registrations & licenses, selection of exposure parameter for various protocols, diagnostic reference levels.

4. Basics of emergency care and life support skills: Basic life support (BLS), sudden Cardiac Arrest (SCA), cardiopulmonary resuscitation (CPR), Automated External Defibrillator (AED).

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SCHOOL OF SCIENCES

Department of Vocational Studies and Skill Development

Credits and Scheme of Examination (Session 2019 to 2021)

B. Voc. (Medical Imaging Technology)

SEMESTER- VI

S. No.	Title of The Paper	Paper Code	Credits	Total
1.	Project / Dissertation work	BVMI601CCP	15	375
	(A) Thesis			
	(B) Presentation			
	(C) Viva -Voce			
2.	Clinical Training & Internship	BVMI602CCP	15	375
	(A) Computed Tomography (CT) Scans			
	(B) Magnetic Resonance Imaging (MRI)			
	(C) Ultrasonography (USG) / X - Ray			
	Total		30	750

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SCHOOL OF SCIENCES
Bachelor of Vocational Programme M.I.T. & M.L.T.

B. Voc. (Medical Imaging Technology)
&
B. Voc. (Medical Laboratory Technology)

VI - SEMESTER

(PROJECT AND CLINICAL TRAINING & INTERNSHIP GUIDELINES)

PROJECT

Each student is encouraged to take up a research project in the area of his/her liking. The project should be original and should have considerable clinical relevance. The concerned faculty members guide the student in his/her project. After completing the project, each student has to submit a complete report of their respective projects.

PROJECT GUIDELINES

All B.Voc. MLT & MIT degree students enrolled in the MANUU should complete a scholarly project as partial fulfillment of requirements for the award of B.Voc. (Medical Laboratory Technogy & Medical Imaging Technology) degree Programme.

What is a project?

A Project is a preliminary form of research. It is an independent investigation. It is very largely the student's own work and is to be pursued by them from the inception till completion. It involves the student in a hands-on project led by a research supervisor/ faculty advisor who will choose, develop and guide the project from its inception to completion.

Purpose of a project work

The purpose of the Project Work is to enable the student to gain practical experience. It enables the student to meet program objectives through development of an appreciation of the interrelations between theory research and practice. A project forms an introduction to scientific thinking and working.

Project suggestions

Prior to the practical work, students must work out a concept with their supervisor that could include any of the following points:

- Scientific question
- Educational objectives (which methods have to be mastered and understood)
- Recent trends in the respective fields
- Case study
- Prospective studies
- Retrospective studies

This scholarly project provides the student with the opportunity to participate in a mentored research experience. The student will actively participate in a research project throughout all current

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Project supervision

The supervisor schedules the project work together with the student and provides an introduction to all laboratory skills that are needed. She or he is then the contact person for all questions and problems during the project. If required, she or he may also ask for a progress report and preliminary results while the project is still ongoing.

The eligibility academic qualification and teaching experience required for recognition as research supervisor and faculty advisor by the MANUU are:

a. Eligibility to be a research supervisor and faculty advisor Shall be a full time teacher in the college or institution where he or she is working.

b. Academic qualification and teaching/professional experience for each branch

Research supervisor (RS)- five years of teaching/ professional experience after the postgraduate qualification in a teaching institution or laboratory approved by MANUU

Faculty advisor (FA)- three years of teaching/ professional experience after the postgraduate qualification in a teaching institution or laboratory approved by MANUU

c. Age:

The age of the RS/ FA shall not exceed 65 years.

Assessment

Five copies of the project report should be submitted to the Dean / Nodal officer along with a soft copy (CD), before the Internship Practical examinations. Projects are assessed with a written report and a seminar. The written report and the presentation, as well as the practical work in the laboratory are to be assessed during Internship Practical Examination.

GUIDELINES FOR THE PREPARATION OF PROJECT REPORTS

1. The project report should be typed in Times New Roman. The size of the titles should be 14 and Bold and the size of the subtitles should be 12 and bold.

2. The matter should have double spacing except for long quotations, footnotes and end notes, which are single spaced. The left-hand margin must be 1.5", other margins should be 1.0".

3. The project report should be hardbound.

4. The project report should be organized in the following subdivisions:

a. Title page
b. Certificate
c. Acknowledgement
d. List of abbreviations used
e. Table of contents
f. Introduction
g. Main project
h. Summary of the project work

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Maulana Azad National Urdu University

page

<----------Title---------->

<----------Subtitle---------->

By

Name of the Candidate

Project Report

In partial fulfillment
of the requirements for the degree of
Degree Name

In

Subject Name

Under the guidance of

Name of the RS and FA

Name of the Department

Name of the College

Place

Year

B. CERTIFICATE

CERTIFICATE BY THE RESEARCH & FACULTY SUPERVISOR

This is to certify that the project report entitled "<Title

" is a bonafide research work done by Name of the Candidate in partial

fulfillment of the requirement for the degree of Degree Name.

Signature of the Research Supervisor
Name
Designation & Department
Date:
Place:

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Signature of the Faculty Supervisor
Name
Designation & Department
Date:
Place:

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ENDORSEMENT BY THE DEAN / NODAL OFFICER OF THE INSTITUTION

This is to certify that the project report entitled "<Title " is a bonafide research work done by Name of the Candidate under the guidance of Name & designation of the Guide.

Seal & Signature of the DEAN
Name:
Designation & Department
Date:
Place:

Seal & Signature of the Nodal officer
Name:
Designation & Department
Date:
Place:

C. Acknowledgement

The inclusion of a paper of Acknowledgment is a traditional practice in the write up of the Project Work. This permits the candidate to write a brief preface and acknowledge the help received from persons and organizations.

d. List of abbreviations used

e. Table of Contents

f. Introduction

This section includes a brief write up about the topic, its scope and importance as well as relation to any previous studies done in the particular topic. It should also mention any present developments.

g. The main project

The main project should be divided into various sections as per the demand of the topic.

h. Summary of the project work

i. List of References (Vancouver Style)

References should be numbered consecutively in the order in which they are first mentioned in the text; they should not be listed alphabetically by author or title or put in date order.

j. Annexures

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POINTS TO KEEP IN MIND

- ☐ The project work should be an original document and candidates should maintain the originality.
- ☐ The candidates should not copy or reproduce anyone else's published or unpublished project.
- ☐ Any arguments that are put forward in the project should be supported with appropriate data.
- ☐ Proper documentation of the information is very important.
- ☐ The methodology to be used should be very clearly stated in the beginning of the work.
- ☐ Plagiarism should be avoided.

NICAL POSTING:

GUIDELINES

- Interns should complete postings in all specialties as decided by the department
- The interns should conduct themselves in a manner befitting the profession.
- The intern should dress appropriately in the clinical areas
- It is mandatory for the intern to wear the white apron with name tag while attending duties
- Each intern should maintain a logbook wherever he/she is posted. The intern has to get signature from the supervising staff at the end of each posting
- Log book should be submitted to the Head of the department at the end of each posting of internship after the period of posting
- Assignments/presentations given during the period of internship has to be duly undertaken and performed.
- Internship completion certificate will be issued from the College office only after passing in the Internship Practical Examination.

The ECT & Internship is a clinical training of **05 months duration** to be done in a Laboratory /Hospital / Medical College approved by the University. MLS trainee students have to go for hands- on clinical training during which they will observe and assist in the techniques and procedures under supervision of an experienced staff in the different areas of medical laboratory like blood and sample collection, pathology , Haematology, Microbiology, Biochemistry , Molecular diagnostics , Histopathology & cytopathology , quality assurance & improvement etc . The students will be required to prepare at least one case study in every section, in all not less than **5 case studies.** The case studies will be verified by the supervisor / in charge under whom they work. It is compulsory to submit duly signed case studies to the clinical posting incharge before final examination . The supervisor / in charge will issue a duly signed and stamped certificate after satisfactory completion of the training . The ECT & Internship examination will include presentation of the case studies , written examination of the techniques and viva voice for evaluation of knowledge and skill .

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