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Item No-

Rayat Shikshan Sanstha's

KARMAVEER BHAURAO PATIL COLLEGE VASHI

(**AUTONOMOUS COLLEGE**)

Sector-15- A, Vashi, Navi Mumbai - 400 703

Program: Medical Imaging Technology.

Course: S.Y.B.Sc. Medical Imaging Technology

(National Education Policy-2020 , Grading and SemesterSystem with effect from the academic year 2023-2024)

Rayat Shikshan Sanstha's

Karmaveer Bhaurao Patil College Vashi Autonomous College

Syllabus

Sr. No.	Heading	Particulars
1	**Title of Course**	**S.Y.B.Sc. Medical ImagingTechnology**
2	**Eligibility for Admission**	**12th Science and equivalent [of recognized Boards]**
3	**Passing Marks**	**40%**
4	**Ordinances/Regulations (if any)**	-----
5	**No. of Years/Semesters**	**One year/Two semester**
6	**Level**	**U.G.**
7	**Pattern**	**Semester**
8	**Status**	**Revised**
9	**To be implemented from Academic year**	**2024-2025**

Preamble

Imaging technology is the branch or speciality of medicine that deals with the study and application of imaging technology to diagnose and treat the disease, the basic aim is to provide students with knowledge and training that will enable them to work in various lab & Hospital settings.

Educational Pedagogy:

The course design is based on NEP2023 guidelines where learner is given a choice to have vertical mobility while pursuing this program. His annualized credits earned will be banked to allow his subsequent year's enrollment. The 4 year degree program is designed as –

- 1st year BSc with Certification in X-ray tech
- 2nd Year BSc with Adv X-ray & CT in Medical Imaging Technology &
- 3rd Year BSc is with Degree in Medical Imaging Technology including MRI Technologist.
- 4th Year BSC is with Bachelor's Hons in Medical Imaging Technology.

The pedagogical design is based on the core objective of making students job ready and hence a lot of focus is given in learner's engagement through Industry based skilling in Hospitals.

As anyone who seeks admission in this program comes from a non-healthcare background, the course starts with a platform setting training to make learner understand the typicality and Dos and Don'ts of Healthcare Organizations.

Industry interface is divided into 3 phases of learning as –

- Observership – Objective is to see what is being taught in the class room through clinical sessions on the subject.
- On The Job Training – Objective is to learn the job skills by working with someone.
- Internship – Working independently, but under supervision as per defined job role.

Considering that the program needs to empower job readiness of learners, a lot of focus is kept in active engaging Life Skills workshops. These cover topics like Self Awareness, Objective setting, Team Work, Leadership Development, Time Management, Communication Skills, Interpersonal abilities etc. Program also focuses in creating a better path for students to pursue their higher education opportunities in healthcare sector. As such special skill enhancing modules like Basic Life Support, Patient care techniques, Hospital Administration and Public Health etc. are included in the curriculum. This will help learners to get into PG programs like Masters in Hospital Management or Masters in Hospital Administration or Masters in Public Health.

As regards to the Core expertise of the program on Imaging Technology, key subjects that get covered are –

X-Ray

X-ray technologist responsible for Using x-ray equipment to take radiographic images of patients' bones, tissues, and organs as per physicians' written orders.

Explaining x-ray procedures to patients and answering their questions. Working closely with the resident Radiologist to determine whether further tests are required.

Maintaining an accurate record of completed x-ray procedures

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CT Technology
CT technologists take diagnostic images of patients' internal structures using computerized tomography equipment. They ensure that patients are correctly positioned and closely monitored during CT scans.

MRI
A non-invasive imaging technology used to investigate anatomy and function of the body in both health and disease without the use of damaging ionizing radiation. It is often used for disease detection, diagnosis, and treatment monitoring. It is based on sophisticated technology that excites and detects changes in protons found in the water that makes up living tissues.
An MRI technologist operates a magnetic resonance imaging (MRI) scanner to create several cross-sectional images of an area of a patient's body. These are combined to create a 3D image, which is used as a diagnostic tool.
The technologist, explains the procedure and places the patient in a specific position. For some scans, the technician administers a contrast dye intravenously to improve the quality of the image. (The dye is used to see vascularity in masses or tumours.).

Interventional Radiology
In interventional radiology (also called IR), doctors use medical imaging to guide minimally invasive surgical procedures that diagnose, treat, and cure many kinds of conditions. Imaging modalities used include fluoroscopy, MRI, CT, and ultrasound

Bone mineral density (BMD) is defined as the amount of mineral (calcium hydroxyapatite) per unit of bone and can be used as an indirect indicator of bone strength. The bone mineral density is used to determine if osteopenia or osteoporosis are present.

Mammography
Screening mammography is a specific type of breast imaging that uses low-dose x-rays to detect cancer early – before women experience symptoms – when it is most treatable.

Fluoroscopy is an imaging modality that allows real-time x-ray viewing of a patient with high temporal resolution. It is based on an x-ray image intensifier coupled to a still/video camera. In recent years flat panel detectors (which are similar to the digital radiography used in projection radiography) have been replacing the image intensifiers.

Key Objectives of this program:

- To implement NEP 2020 through this Vocational Skills development program
- Learners will inculcate right attitude, skills and knowledge to do the job role of Medical Imaging Technologist as required by the industry.
- Program will also empower learners' abilities to pursue higher education in medical industry

After completing this program, learner will exhibit following skills and knowledge as Medical Imaging Technologist:

- Demonstrate knowledge about the healthcare sector and diagnostic services
- Demonstrate the ability to perform clinical skills essential in providing basic diagnostic services such as Correctly perform, position & scan the patient.
- Demonstrate quality assurance in Imaging works
- Practice infection control measures
- Demonstrate readily availability of medical and diagnostic supplies
- Demonstrate techniques to maintain the personal hygiene needs
- Demonstrate actions in the event of medical and facility emergencies
- Work as a medical Imaging professional with right attitude in any lab setting Additionally, he will be developing following allied skills and knowledge through this program:

- CPR
- Care giver
- Basics on Hospital management
- Good communicator & allied health professional

Scheme of examination for Each Semester

Continuous Internal Evaluation: 40 Marks
Common Test 20 Marks & 20 Marks for Assignment, Projects, Group discussion, Openbook test, online test etc. based on Units of each paper.

Semester End Examination: 60 Marks will be as follows –

I.	**Theory:** The Semester End Examination for theory course work will beconducted as per the following scheme.	
	Each theory paper shall be of two hours duration.	
	All questions are compulsory and will have internal options.	
	Q – I	Subjective questions from Unit – I (having internal options.) 15 M
	Q – II	Subjective questions from Unit – II (having internal options.) 15 M
	Q – III	Subjective questions from Unit – III (having internal options.)15 M
	Q- IV	Objective type questions based on all the Units with equalweightage. 15 M
II.	**Practical**	The Semester End Examination for practical course workwill be conducted as per the following scheme.

Sr. No.	**Particulars of Semester End Practical Examination**	**Marks%**
1	Laboratory Work	80%
2	Journal	10%
3	Viva	10%
	TOTAL	**100**

Program Outcomes (POs)

PO-1	**Disciplinary Knowledge:** Understanding different modalities and their functions in Medical imaging technology like X-ray, CT scan, MRI, Fluoroscopy, Interventional radiology, ECG through on the job training and internships in the hospitals.
PO-2	**Communication Skills:** Develop various communication skills such as reading, listening and speaking skills etc., which we will help in expressing ideas and views clearly and effectively.
PO-3	**Critical Thinking:** Think creatively to propose novel ideas in explaining the scientific data, facts and figures related to science and technology.
PO-4	**Analytical Reasoning and Problem Solving:** Identify, describe, formulate, interpret, analyze the data systematically and solve theoretical and numerical problems in the diverse areas of science and technology and provide alternate solutions to the problems.
PO-5	**Sense of Inquiry:** Curious for asking relevant questions like why and how for better understanding of the basic concepts, fundamental principles, scientific theories and applications related to the study.
PO-6	**Use of Modern Tools:** Use of modern tools, equipment, instrumentation and laboratory techniques to design and perform the experiments and write the programs in different languages (software).
PO-7	**Research Skills:** Ability to search for, find, collect, analyze, interpret and evaluate information/data that is relevant to the subjects related to science and technology being studied.
PO-8	**Application of Knowledge:** Develop scientific outlook with respect to the subjects related to science and technology and also participate in various social and cultural activities.

PO-9	**Ethical Awareness:** Imbibe ethical and social values in personal and social life leading to cultured and civilized personality.
PO-10	**Teamwork:** Work effectively within the groups and individuals, participate and take initiative for various field-based situations related to science, technology and society at large.
PO-11	**Environment and Sustainability:** Understand how development in science and technology and interdisciplinary subjects are taking place for protecting our environment and sustainable developments.
PO-12	**Lifelong Learning:** Ability of self-driven to explore, learn and gain knowledge and new skills to improve the quality of life and sense of self-worth by paying attention to the ideas and goals throughout the life.

***Note: [1] Remembering, [2] Understanding, [3] Applying,[4] Analyzing, [5] Evaluating, 6] Creating.**

Name of the Specific Program: B.Sc. Medical Imaging Technology (MIT)

Program Specific Outcomes (PSO)

At the end of four year program students will understand and be able to

PSO-1	Understanding different branches and their functions of medical Imaging like X-ray, CT, MRI, Fluoroscopy, ECG through on the job training and internships in hospitals.
PSO-2	Demonstrate knowledge using right positioning techniques & perform radiographic procedures of specified imaging modality such as X-ray, CT, MRI technology ensuring safety of patients and personnel involved.
PSO-3	Identify and analyse artifacts related to various Imaging domains of clinically relevant procedure of the patients & maintain quality of the images also determine right exposure factors to achieve optimum radiographic procedures consistent with minimizing dose to patients.
PSO-4	Understand and apply principles of radiation protection for the patient, technologist, and others and recognize their technologist role in the health care system and function effectively in a multidisciplinary health care team.
PSO-5	Learning the advancement & modifications of high-resolution technology in the Imaging set up, their upkeep and error minimization.
PSO-6	Practice effective written communication skills for creating & analyzing medical imaging reports.
PSO-7	Employ effective communication practices to provide sufficient information effectively to the patient about the imaging options available, purpose of the procedure, benefits, possible adverse consequences, and limitations
PSO-8	Developing a professional Imaging technologist through various ability enhancement programs on communication skills, life skills, field visits and personality development workshops.
PSO-9	Understanding the larger scope of medical profession and creating an opportunity for higher education in hospital management domain and overseas work opportunities.
PSO-10	Develop ability to understand the structure and development methodologies of software systems and demonstrating the use of various modern technical tools like table styles, shapes, charts, graphs, data tools and solve basic and logical-mathematical problems and statistics & learn to create error free documents using excel,word & power-point.

Course Outcome (CO)		
Course Code	**Name of the Course**	**Course outcomes**
UGMITC301A	**CT TECHNOLOGY-1**	**CO1**. Students will be able to apply radiation dose reduction techniques for pediatric and adult patients [2 & 3*] **CO2**.Students will be able to Discuss the role and the ethical considerations of the CT technologist in reducing radiation dose including technical factor selection, positioning, and shielding.[2*] **CO3**.Students will use CT equipment to obtain diagnostic quality imaging.[1 & 3*]
UGMITC301B	**PATIENT POSITIONING & PROTOCOLS -1**	**CO1**.Students will be able to prepare & position patient according to different study.[2*] **CO2.**Students will demonstrate ability to communicate with patients[3*] **CO3**.Students will be able to identify and correct positional errors and technical error[4*]
UGMITC302	**CROSS SECTIONAL ANATOMY**	**CO1**. Students will be able to differentiate major anatomical regions in the transverse, coronal and sagittal plane[2*] **CO2**. Identify major anatomical structures of the head, neck, thorax, abdomen, pelvis, spine and extremities on cross-sectional images[3*] **CO3**. identify pathology demonstrated within cross-sectional images[2*]
UGMITGE303	**SOFT SKILLS**	**CO1**. To draft emails effectively, to learn being assertive at workplace, to develop reading and comprehension skills through Book Analysis project. [2*] **CO2**. To make them emotionally balanced, thereby enhancing their decision making and problem solving skills.[2 & 3*] **CO3**. To make them set their short and long term aims, to utilize time effectively and to make them research about the common challenges at work station and come up with solutions, by researching and brainstorming.[2 & 4*]
UGMITSEC304	**BASIC TECHNIQUES IN HOSPITAL MANAGEMENT**	**CO1**. Students learn about the organization and the different functions of management [2*] **CO2**. . Hospital planning and administration: Students learn to manage the hospital's planning and administration [2 & 3*]

		CO3. Demonstrating the necessary knowledge skill and competencies required managing the related areas within the hospital [3 & 4*]
UGMITAEC305	**MS-OFFICE-1**	**CO1**: Understand the navigation of the Ribbon Interface in MS word, excel [2*] **CO2**: Perform basic editing functions, formatting text, copying, and moving objects and text in MS word, excel [3 & 4*] **CO3**: Create charts, graphs, and tables [1& 3*]
UGMITC401A	**CT TECHNOLOGY-2**	**CO1**.Students will be able to construct multiplanar reformation of data to obtain diagnostic quality images[2 & 3*] **CO2**.Study the principles of image formation, including the basic principles and the components equipment of CT technology[1 & 3*] **CO3**.: Develop problem-solving skills and the ability to apply physics principles to a realworld situation.[2 & 3*]
UGMITC401B	**PATIENT POSITIONING & PROTOCOLS -2**	**CO1.Students will learn** General preparation care and techniques, After care and Risk.[1 & 3*] **CO2.**Understand the principles of image processing and how to adjust exposure factors to optimize image quality.[2*] **CO3.** Students will be train with good clinical skill related to CT imaging techniques which leads to entrepreneurial qualities and employability. [2 & 4*]
UGMITC402	**DIAGNOSTIC INVESTIGATION & DISEASES**	**CO1**.Student will be able to correlate the cross sectional anatomy to radiological images seen on CT[2*] **CO2**.Student should be able to explain how the anatomy changes when different sections of the same system are taken and correlate to the placement in the body.[2 & 3*] **CO3.**Student will be able to interpret which system of the body does the specimen represents[4*]
UGMITGE403	**PATIENT CARE TECHNIQUES**	**CO1.** Ability to know patient health and disease conditions [2*] **CO2.** Ability to take nursing care of patient in OPD and IPD[2 & 3*] **CO3**. Ability to heal the ailing patient [2*]
UGMITSEC404	**ADVANCE HOSPITAL MANAGEMENT**	**CO1.**Understand the importance of human resource Management. Design relevant appraisal methods for employee compensation, rewards and benefits. Organize training and development activities to enhance the knowledge.[2*] **CO2.** Enables the candidate to understand how the cost of material. Increase the profitability with effective and efficient utilization of available resources of a healthcare [2 & 4*] **CO3.** Improve hospital efficiency. Develop, implement, measures hospital performance. Enhance hospital quality culture and professionalism. Includes case-based learning, relevant scientific literature [2 & 3*]
UGMITAEC405	**MS OFFICE-2**	**CO1.**Understand the navigation of the Ribbon Interface in MS excel & PPT [2*]

		CO2. Perform basic editing functions, formatting text, copying, and moving objects and text in MS excel & PPT[2 & 3*] **CO3.**Create charts, graphs, and tables [1 & 3*]

Course Outcome (CO) Practical

Course Code	Name of the Course	Course outcomes
UGMITCP301 A	**Computed Tomography Technology - 1**	**CO1:** Describing various generations of CT & understanding the difference between them. **CO2:** Identify various CT Equipment & Note their functions. **CO3:** Applying ALARA Concept in CT Department
UGMITCP301B	**Patient positioning & protocols 1**	**CO1:** Demonstrating positioning for CT scan of Head & neck region & patient preparation & pre & post scan instructions. **CO2:** Demonstrating positioning for CT scan of Chest & Spine region & patient preparation & pre & post scan instructions. **CO3:** Demonstrating positioning for CT scan of Abdomen region & patient preparation & pre & post scan instructions. .
UGMITCP302	**Cross sectional Anatomy**	**CO1:** Identify & note the functions of Head & neck region. **CO2:** Identify & note the functions of thorax & muscular skeletal system of upper extremity. **CO3:** Identify & note the functions of Lower extremity & reproductive system.
UGMITCP401A	**CT Technology 2**	**CO1:** Develop skills in image analysis. **CO2:** Understanding different types of contrast & uses of it **CO3:** Clinical Integration & Interpretation of various types of CT Reports of head, neck, face, trunk, chest, upper extremity & lower extremity
UGMITCP401B	**Patient positioning & protocols 2**	**CO1:** Demonstrating positioning for CT scan of upper & lower extremity region & patient preparation & pre & post scan instructions. **CO2:** Demonstrating positioning for CT scan of reproductive region & patient preparation & pre & post scan instructions. **CO3:** Demonstrating positioning for CT guided procedures region & patient preparation & pre & post scan instructions. .

UGMITCP402	**Diagnostic Investigation & diseases**	**CO1:** Identify various ECG Equipment & note their functions **CO2:** Identify various USG Equipment & note their functions **CO3:** Understanding the difference between communicable & non – communicable diseases through various charts & presentations [Acute & chronic]

S.Y.BSc. Medical Imaging Technology : SEM III

Paper 1 [UGMITC301]: COMPUTED TOMOGRAPHY [CT] TECHNOLOGY-1 MAJOR THEORY]				
Course Code	**Unit**	**Topics**	**Credits**	**L/week**
UGMITC301A	I	Introduction to CT technology	3	3
	II	Components of Computed Tomography		
	III	Radiation Safety		
PAPER -2 PATIENT POSITIONING & PROTOCOLS-1[MAJOR THEORY]				
UGMITC301B	I	Patient Positioning of Head, Neck & Thorax Region	3	3
	II	Patient Positioning of Spine & musculoskeletal Region		
	III	Patient Positioning of Abdomen & Pelvis Region		
Paper 3: [UGMIT302]: CROSS SECTIONAL ANATOMY [MINOR THEORY]				
UGMITC302	I	Cross sectional anatomy of Head & Neck	3	3
	II	Cross sectional anatomy of Thorax and Musculoskeletal system of Upper extremity		
	III	Cross sectional anatomy of Lower extremity & Reproductive System		
Paper 4: [UGMITGE-303]: SOFT SKILLS [GE THEORY]				
UGMITGE303	I	Assertive communication & Book analysis	2	2
	II	Emotional Quotient		
	II	Self-Leadership Skills		
Paper 5 [UGMITSEC304]: BASIC TECHNIQUES IN HOSPITAL MANAGEMENT [SEC THEORY]				
UGMITSEC304	I	Principles of Hospital Management	2	2
	II	Structure and Services of Hospital		
	III	Clinical and Non-clinical Services in Hospital		
PAPER 6 [UGMITAEC305]: MS OFFICE-1[AEC THEORY]				
UGMITAEC305	I	Introduction to MS office	2	2
	II	Introduction to Excel		
	III	Introduction to Power-point		
Semester 3 Practical				
UGMITCP301A	**MAJOR**	CT technology equipment & functions	1	1
UGMITCP301B	**MAJOR**	Patient Positioning & Protocols	1	1
UGMITCP302	**MINOR**	Identify,Locate and note functions of cross sectional anatomy	1	1

INTERNSHIP			
	CT technology Expertise	2	2

Semester 3
S.Y..BSc. Medical Imaging Technology

Paper-1		
Course Code	**Title**	**Credits**
UGMITC301	**CT TECHNOLOGY & POSITIONING-1 [MAJOR THEORY]**	3
Unit I	**Introduction to CT Technology** • Definition Evolution of terms, Research contributors Radon 2. Hounsfield 3. Ambrose 4. Cormack Historical events 1. 1917 2. 1967 3. 1970 4. 1971 5. 1973 6. 1974 7. 1989 • Computed Tomography Generations 1. First 2. Second 3. Third 4. Fourth 5. Fifth 6.Helical & MultiSlice Compted Tomography • Emerging technology & innovation Characteristics of X-radiation Sources Natural,Artificial • Electromagnetic radiation - Ionization,Interactions with matter Compton effect ,Photoelectric effect ,Wave particle duality Reflection/transmission ,Absorption/attenuation	
Unit II	**COMPONENTS OF CT** • CT Scanner Components and Operations , Radiographic tube , Filters,Collimators,Detectors,Data acquisition system, Computer and array processor . • Pixel, Matrix, Voxel, x, y, z coordinates ,Scan field of view (sfov) ,Display field of view (dfov) , Linear attenuation coefficient,CT/Hounsfield number,Partial volume averaging , Window width (ww) and window level (wl) • Spatial resolution-Contrast resolution m. Noise n. Aliasing,Digital imaging ,Annotation ,Scanogram , Region of interest (ROI) ,Standard vs. volumetric data acquisition Half-scan, full-scan, overscan ,interscan delay, Rays and viewsConsoles H. Monitors and archival devices.	

UNIT III	**RADIATION SAFETY** • As Low As Reasonably Achievable(ALARA concept) Basic radiation protection techniques & Application of techniques to Patient, Self & Others • Time, distance and shielding • Technical factor selection Equipment maintenance • **CT "Spot Radiation Exposure Reduction Devices "for** Thyroid, Genitals, Eyes	
COURSE CODE	**TITLE** **Paper-2**	**CREDITS**
UGMITC301B	**PATIENT POSITIONING & PROTOCOLS-1**	**3**
Unit I	**HEAD & NECK** • Indications & Contraindications for each protocol, Indications for contrast media` Types of contrast media, Contraindications for contrast media, Informed consent requirements, Patient preparation and post-procedure instructions • Protocol parameters-Range, Azimuth, Anatomical landmarks Patient orientation, Patient position, Scout image parameters, Scan field of view, Display field of view. • Mode, Algorithm , Gantry angle,Technical factor selection, Range, Table indexing, Z-axis selection , Window level, Window width , Matrix size,Image annotation parameters ,Imaging planes, Spiral/helical application ,Filming format , Image archiving ,Identification of pathology , Charting and documentation requirements. • CT head (brain, sella turcica, ventricles, etc.) with & without contrast,cranio-facial deformities, trauma, circulus ateriosis cerebri (circle of Willis), seizure , thalamus and hypothalamus,pituitary gland,rule out metastasis,multiple sclerosis , pineal gland ,optic nerve opthalmic artery and retinal vein Maxillofacial, (orbits, nasal bones, facial bones, tempromandibular joints, etc.),facial bones for trauma, paranasal sinuses ,temporal bone (internal auditory canals, posterior fossa, base of skull, etc.) Spiral/helical head with or without contrast,neck (nasopharynx, larynx, parotid glands, etc.) with or without contrast,neck (spine, submandibular glands, vascular structures, etc.) with contrast ,neck for thyroid and parathyroid glands Stereotaxis Spiral/helical neck Others as determined by program and clinical faculty	

UNIT II	**Chest & Spine Region** • Thorax with & without contrast , mediastinal structures (with or without contrast) ,(bone windows) , (lung windows) , aortic dissection ,pulmonary embolism, sternum , thymus gland, (thoracic lymph nodes) disease staging , (trauma) Spiral/helical,cervical spine,thoracic spine,lumbar spine,spine (cervical, thoracic or lumbar) postmyelogram ,spine (trauma) Spiral/helical , spine upper extremity , lower extremity	
UNIT III	**Abdomen Region** • Abdomen with & without contrast ,pancreas ,liver , renal system ,adrenal glands ,aortic dissection , abdomen for vascular structures,spleen,gastrointestinal system ,gallbladder ,suspected appendicitis , abdominal lymph nodes (disease staging) ,metastasis ,abdomen (trauma) Spiral/helical abdomen	

Semester 3

Paper -3		
Course Code	**Title**	**Credits**
UGMITC302	**CROSS SECTIONAL ANATOMY** **MINOR**	3
Unit I	**Head and Brain Cross sectional anatomy of the brain** • Fissures (sulci), Longitudinal cerebral , Lateral (Sylvian) , Central (of Rolando) , Convolutions (gyri),Precentral ,Postcentral Sinuses • Frontal, Maxillary, Ethmoidal, Sphenoidal,Facial bones Mandible -Maxillae ,Zygomas, Nasal bones Facial muscles- Orbicularis oculi , Orbicularis oris , Masseter • Cranial bones -Frontal,Ethmoid ,Nasal conchae (turbinates) Nasal septum , Parietal , Sphenoid Lobes of the brain and midline cerebral hemisphere structures Frontal,Parietal, Occipital , Temporal • Brainstem -Diencephalon,Thalamus , Hypothalamus, Optic chiasm , Optic tracts ,Pituitary gland , Mammillary bodies Pineal gland ,Midbrain, Pons , Medulla oblongata , Spinal cord • Cranial nerves -Olfactory,Optic,Occulomotor,Trochlear. Trigeminal,Abducens,Facial,Vestibulocochlear,Glossopharyngeal Vagus ,Accessory ,Hypoglossal. • Meninges -Dura mater, Arachnoid, Pia mater • Arteries (Circle of Willis)Basilar , Internal carotid , Anterior and posterior communicating ,Anterior and posterior cerebral , Middle cerebral • Veins -Venous sinuses, Internal jugular Ventricular system Lateral vertricles (anterior, body, posterior, inferior or temporal and trigone or antrium) , Interventricular foramen (of Monro) ,Third ventricle Choroid plexus. • Veins -Venous sinuses, Internal jugular	

	Ventricular system Lateral vertricles (anterior, body, posterior, inferior or temporal and trigone or antrium) , Interventricular foramen (of Monro) ,Third ventricle Choroid plexus.	
Unit II	**Cross-sectional anatomy of tissues,Visceral organs,Muscles, Ligaments,Bone & joints of Chest & Mediastinum, Musculoskeletal system of upper extremity** • Neck - Bones, Cervical vertebrae Organs -Pharynx,Larynx ,Esophagus, Trachea , Salivary glands Thyroid gland ,Parathyroid glands ,Lymph nodes. • Chest and mediastinum Bony thorax -Thoracic vertebrae,Sternum,Ribs ,Costal cartilages Scapulae Pulmonary-Apices (lung), Diaphragm, Angles, Hilum ,Lobes (lungs) ,Trachea,Carina ,Primary (mainstem) bronchi ,Secondary bronchi Mediastinum -Thymus gland ,Heart, Aortic arch ,Branches of the aortic arch ,Descending (thoracic) aorta ,Inferior vena cava, Esophagus ,Trachea, Thoracic duct , Lymph nodes • Musculoskeletal Upper extremities Shoulder,Bony anatomy Clavicle, Scapula, Humerus,Acromioclavicular joint ,Muscles and tendons -Deltoid , Supraspinatus, Infraspinatus , Teres minor , Subscapularis ,Supraspinatus tendon ,Biceps tendon • Elbow Bony anatomy,Humerus,Radius,Ulnar,Muscles and tendons .Anterior group ,Posterior group,Lateral group,Medial group ,Ligaments ,Ulnar collateral,Radial collateral, Annular Neurovasculature ,Brachial artery ,Radial artery, Ulnar artery, Basilic vein ,Cephalic vein ,Median cubital vein,Ulnar nerve,Hand and wrist,Bony anatomy, Carpal bones,Radius ,Ulnar • Tendons - Palmar tendon group,Dorsal tendon group,Triangularfibrocartilage complex ,Neurovascular,Ulnar artery,Ulnar nerve ,Radial artery ,Median nerve.	

Unit III	**Cross sectional anatomy of Lower extremity,Abdomen & reproductive system** • Lower Extremities Hip - Bony anatomy ,Labrum and ligaments,Muscle groups Neurovasculature Knee - Bony anatomy ,Menisci and ligaments,Muscle, Vasculature ,Foot and Ankle ,Bony anatomy ,Ligaments , Tendons Muscles • Abdominal organs and structures Bony structures - Lumbar vertebrae Abdominal cavity,Peritoneum,Pertionealspace Retroperitoneum-Retroperitoneal space Liver , Gallbladder and biliary system, Pancreas and pancreatic ducts,Spleen,Adrenal glands ,Urinary system and tract, Kidneys ,Ureters ,Stomach , Small intestine, Colon • Pelvic organs -Urinary bladder,. Ureter,Urethra Small intestine-Terminal ilium and iliocecal valve, Colon-Ascending ,Transverse, Descending , Sigmoid,Rectum. Veriform appendix Female reproductive organs - Vagina ,Cervix , Uterus ,Ovaries. Males reproductive organs –Penis, Testes, Prostate gland, Seminal vesicles	

S.Y.BSc.
Medical Imaging technology

Paper 3 Generic		
Course Code	**Title**	**Credits**
UGMITGE303	**SOFTSKILLS**	2
Unit I	**ASSERTIVE COMMUNICATION & BOOK ANALYSIS** • Email Etiquettes- Drafting precise emails, leveraging polite and relevant vocabulary and mentioning concise subjects. • Assertive Communication- Consequences of passive and aggressive comm, learning Assertive to take a polite stand for self, vocabulary and phrases that are regularly used while communication assertively. • Book Analysis Project- Students to choose a book from the list of selected genre, read and update the summary weekly, prepare a 5-6 slide ppt and present his/her over all understanding	
Unit II	**EMOTIONAL QUOTIENT** • Basic Emotions (Intro to all human emotions like happy, sad, anger, insecurity etc..) a human goes through.. , their effect on our thought process. Consequences of being over and under emotional. (explaining mind over matter concept, discussing some case studies related to the topic, IQ vs EQ Rational Thinking vs Emotional Thinking (results of practical thinking, emotional thinking, balanced thinking, some case studies) • Movie Analysis project (Students to choose a movie from the list of selected genre, watch with a research perspective, summarize it, add his/her views into it and prepare a 5-6 slide ppt and present his/her over all understanding.	
Unit III	**SELF-LEADERSHIP SKILLS** • Productivity Management (Managing ourselves along with the time, Big rock Theory, ABCDE method, urgent vs imp, setting priorities and posterior ties, confronting procrastination) Making smarter goals (Vision, weekly and daily plans in writing, discussing case studies of visionary people through an assignment. Personal Effectiveness at work place. • (Some minor yet significant elements required like physical	

	appearance, way of talking, working, introducing self and others, coming across challenges at work place, looking into employability skills) Research Project (students to cover a clinic or lab, identify a challenge they have had recently gone through and share how did they solve it- through a written project)	

Paper IV – Basic Techniques in Hospital Management SEC		
UGMITSEC 304	**Title**	**Credits**
		2
Unit I	**Principles of Hospital Management** • Basic Principles of Hospital management • Functions of management • Planning and staffing of management	
Unit II	**Structure and Services of Hospital** • Hospital Departmental hierarchical Structure • Laboratory and Radiology services • Blood bank and Pharmacy services • Ambulance and Medical Records	
Unit III	**Clinical and Non-clinical Services in Organization** • OPD and IPD (Wards) • Operation Theatres, ICU, Cathlab • Dialysis units, Endoscopy, Emergency • Pharmacy, Housekeeping, Accounts and supply chain management	

Paper -5		
CourseCode	**Title - MS-OFFICE**	**Credits**
UGMITSEC405		2
Unit I	**I: MS WORD** **Introduction to Microsoft Word** • Overview of Microsoft Word interface • Creating a new document • Opening, saving, and closing documents • Understanding the Ribbon and Tabs • Customizing the Quick Access Toolbar **Basic Text Formatting** • Font formatting (size, style, color) • Paragraph formatting (alignment, indentation, spacing) • Bullets and numbering • Using styles for consistent formatting **Document Layout and Design** • Page setup (margins, orientation, size) • Headers and footers • Page numbering • Columns and section breaks **Working with Tables** • Creating and formatting tables • Inserting and deleting rows and columns • Merging and splitting cells • Sorting and filtering data in tables	
Unit II	**MS EXCEL** **Create Worksheets and Workbooks** • Creating new workbooks • Saving workbooks • Closing workbooks • Opening workbooks • Selecting cells • Import data • Add a worksheet to an existing workbook • Copy and move a worksheet **Navigate in Worksheets and Workbooks** • Search for data within a workbook • Navigate to a named cell, range, or workbook element	

	• Insert and remove hyperlinks **Format Worksheets and Workbooks** • Hide or unhide worksheets • Hide or unhide rows and columns • Customize the Quick Access toolbar • Modify document properties • Display formulas **Apply Custom Data Formats and Validation** • Create custom number formats • Configure data validation **Apply Advanced Conditional Formatting** • Create custom conditional formatting rules • Create conditional formatting rules that use formulas • Manage conditional formatting rules **Data Filtering** • Using AutoFilters • Applying a custom AutoFilter • Creating advanced filters • Applying multiple criteria • Using complex criteria • Copying filtered results to a new location • Using database functions	
Unit III	**PowerPoint Presentation** **Create and Manage Presentations** • Create a Presentation • Insert and Format Slides • Modify Slides, Handouts, and Notes • Change Presentation Options and Views • Configure a Presentation for Print • Configure and Present a Slide Show **Insert and Format Text, Shapes, and Images** • Insert and Format Text • Insert and Format Shapes and Text Boxes • Insert and Format Images • Order and Group Objects	

S.Y.BSc.

Medical Imaging technology

PRACTICAL - SEM 3

UGMITCP301A	**COMPUTED TOMOGRAPHY TECHNOLOGY-1** Identification of components of CT scan & note the functions Demonstrate patient positioning of different studies Case studies	1
UGMITCP301B	**PATIENT POSITIONING & PROTOCOLS-1** Patient Positioning & protocols of Head, Neck & Thorax scans Patient Positioning & protocols of Spine & musculoskeletal scans Patient Positioning & protocols of Abdomen & Pelvis scans	1
UGMITCP302	**CROSS SECTIONAL ANATOMY** Locate each anatomical structure of the Head,Neck,Thorax,Musuloskeletal,Spine,Abdomen & Pelvis region. Identification anatomy of transverse axial, coronal, sagittal and oblique planes & note the functions.	

SEMESTER IV

Medical Imaging Technology

Semester 4

Paper I		
Course Code	**Title**	**Credits**
UGMITC401A	**CT TECHNOLOGY-2MAJOR**	3
Unit I	**Image Processing & Artifacts in CT** • Pixel, Matrix, Voxel, x, y, z coordinates ,Scan field of view (sfov) ,Display field of view, Linear attenuation coefficient,T/Hounsfield number.Window width (ww) and window level (wl) ,Spatial resolution, Contrast resolution, Noise, Aliasing, Digital imaging, Annotation ,Scanogram, Region of interest (ROI), Standard vs. volumetric data acquisition ,Half-scan, full-scan, overscan Interscan delay ,Rays and views, • Image reconstruction CT computer,Minicomputer and microprocessors, Array processors Back-projection Filtered back-projection (convolution), Fourier reconstruction, 3-D Interpolation Image reformation,Image smoothing,Edge enhancement Gray-scale manipulation ,Three-dimensional processing, Stereotaxis, Radiation oncology treatment planning. • Recording - Film, Multiformat cameras, Laser cameras Archiving - Tapes, Disks, Laser and optical Patient Based Artifacts,Scanner Based Artifacts,Helical & Multisection artifacts,Digital artifacts.	
Unit II	**Pharmacology** • **Contrast Media** Diagnosis Differentiation Allergies Disease processes • **Modes of administration** Intravenous	

	Oral Rectal • **Chemical Properties** Intravenous -Ionic ,Dimers ,Monomers Nonionic -Dimers ,Monomers Oral- Barium-based, Iodine-based, Other, Rectal • **Common Drugs** Antianxiety Sedatives Pain relief Antispasmodics Other • **Drug Dose Calculations** Adults Children • **Reactions** Types Mild Moderate Severe Contrast media reaction treatment	
Unit III	**Clinical Integration & Interpretation of CT Reports** • **Head, neck, face** Normal CT head & neck, Brain tb ,meningitis,Meningioma, Skull vault osteoma, Sturge-Weber syndrome,lobar intracerebral hemorrhage,Neck ,angiogram(with & without contrast),Neck lipoma,Cervical spine,degenerative changes. • **Trunk & chest** Vertebral compression fracture, Spondylodiscitis - dorsal spine,Pulmonary tuberculosis,Cardiac arrest (CT) • **Abdomen, pelvis** Acute pancreatitis, Extraperitoneal bladder rupture, Small bowel obstruction,COVID-19 pneumonia.Crohn's disease. Acute appendicitis • **Upper & Lower extremity** Shoulder dislocation, fracture of humerus, radial head fracture,Ulna fracture,isolated ulna shaft fracture,Distal radius & ulna fractures ,gangrene leg,osteoporosis,Fracture and dislocation of hipbone (acetabulum)	

Paper 1 [UGMITC401] : CT TECHNOLOGY -2 (MAJOR THEORY)				
Course Code	**Unit**	**Paper-1 Topics**	**Credits**	**L/week**
UGMITC401A	I	Image Processing & Artifacts in CT	3	3
	II	Basic Pharmacology in CT		
	III	Clinical Integration & Interpretation		
UGMITC401B		**Paper -2 Patient Positioning & Protocols -2 [MAJOR THEORY]**	3	3
	I	Patient positioning Upper & lower extremity Region		
	II	Patient Positioning & Protocols Reproductive region		
	III	CT guided Procedure Protocols		
Paper 3: [UGMIT402]: Diagnostic Investigation & Diseases [MINOR THEORY]				
UGMITC402	I	ECG	3	3
	II	Ultrasound		
	III	Communicable & Non-communicable diseases		
Paper 4: [UGMITGE403] GE PATIENT CARE TECHNIQUES				
UGMITGE403	I	Basics of patients care	2	2
	II	Bed side care of patient		
	II	Geriatric disease management		
Paper5 [UGMITSEC-404]:ADVANCE TECHNIQUES IN HOSPITAL MANAGEMENT [THEORY]				
UGMITSEC404	I	Human Resource Management	2	2
	II	Principles of Material Management		
	III	Principles of Quality Management		
UGMITAEC405]:		**PAPER 6 [UGMITAEC305]: MS OFFICE-2 [THEORY]**		
	I	INTRODUCTION TO MS-OFFICE	2	2
	II	BASIC OF MS EXCEL		
	III	BASIC OF MS POWERPOINT		

Semester 4 Practical				
UGMITCP401A	**MAJOR**	Image processing & interpretation of various CT studies	1	1
UGMITCP401B	**MAJOR**	Patient preparation & Protocols	1	1
UGMITCP402	**MINOR**	E.C.G & USG assistant techniques & patient preparation & equipment functions.	1	1
UGMITGE403	**GE**	PATIENT CARE TECHNIQUES	1	1
INTERNSHIP				
	ECG & USG Assistant technology Expertise		2	2

COURSE CODE	TITLE Paper-2	CREDITS
UGMITC401B	**PATIENT POSITIONING & PROTOCOLS-2**	**3**
Unit I	**UPPER EXTREMITY & LOWER EXTREMITY** • Indications for each protocol , Contraindications for each protocol ,Indications for contrast media` Types of contrast media, Contraindications for contrast media, Informed consent requirements, Patient preparation and postprocedure instructions • Protocol parameters ,Range,. Azimuth ,. Anatomical landmarks,Patient orientation, Patient position ,Scout image parameters, Scan field of view ,Display field of view. • Mode ,Algorithm , Gantry angle,Technical factor selection, Range, Table indexing, Z-axis selection , Window level, Window width , Matrix size,Image annotation parameters ,Imaging planes, Spiral/helical application ,Filming format , Image archiving ,Identification of pathology , Charting and documentation requirements. • Upper extremity,lower extremity, soft tissue extremity, pelvic girdle, extremity (trauma)	
UNIT II	**Reproductive Region** • CT pelvis without contrast ,pelvis for female genitourinary system, pelvis for male genitourinary system ,pelvimetry ,scrotum Spiral/helical pelvis ,lower extremity,soft tissue extremity, pelvic girdle , extremity (trauma)	

UNIT III	**Procedure Protocols** • Indications for each protocol • Contraindications for each protocol • Indications for contrast media • Contraindications for contrast media • Informed consent requirements • Patient preparation and postprocedure instructions	

Paper -3		
Course Code	**Title**	**Credits**
UGMITC402	**DIAGNOSTIC INVESTIGATION & DISEASES MINOR**	3
Unit I	**ECG techniques** • Description of machine types, Description of paper,Description of jelly, Technique of ECG recording , Energy source and electrical disturbances ECG on pacemaker patient .Determination of heart beats ,ECG abnormalities,Demonstration of recording of paper loading • Demonstration of patient Demonstration of cable connection,Demonstration of earthing of ECG equipment,Demonstration of pacemaker patient ECG recording, Demonstration of application of loads other than 12 leads Interpretation of normal and abnormal ECG	
Unit II	**USG Assistant** • USG Physics,Reflection,scattering, Components of machine,Spatial Resolution, Temporal Resolution Contrast Resolution • Usg safety,Usg obstretics,USG Pelvis,USG breast,USG abdomen,USG of musculoskeletal system.PCPNDT rules & regulations.	

Unit III	**Communicable & Non- communicable Diseases** • Chicken pox, Common cold, Conjunctivitis, Hepatitis-A,B,C,HIV,Influenza (flu),Meningitis,Pneumonia,SARS (severe acute respiratory syndrome),Tuberculosis, • Diabetes-Type-1,type-2,Cardiovasculardisease,Cerebrovascular disease,Common cancers-cervical,breast & oral.	

Paper -4		
CourseCode	**Title**	**Credits**
UGMITC403	**PATIENT CARE TECHNIQUES**	2
Unit I	**BASICS OF PATIENT CARE** • Introduction to health HB defination, influencing aspects and factors Hospital setups information :healthcare services, hospitals , hospital team, medical practice in india • Care giver for elderly definition : role & responsiblities, qualities of art of caring, • Tools and equipment : thermometer,pulse-oximeter,BP machine, wheel chair, surgical bed, linen.	
Unit II	**BED SIDE CARE OF PATIENT** • Patient grooming : cleaning(bathing, hair, eyes, ears,using hearing aid, visual aid,) • First Aid : Cardiac arrest, bleeding, shock, unconsciousness, choking,eletric shock, burns,fracture. • Bed making(types of bed) nutrition (nutrient, diet plan, types and methods of feeds, medication (forms,routes of	

	administration,documents of medication) elimination (devices, enema) vital signs and physical strength	
Unit III	**GERIATRIC PATIENT CARE** • Disease overview, disorders(communicable , non communicable, cancer) prevention of injury - common accident • laws and policies - national law, rights of elder • care of care giver -time management, personal hygiene, dealing aggression of patient, • career growth of care giver	

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Semester 4

Paper 5		
Course Code	**Title**	**Credit**
UGMITSEC404	**Advance Technique In Hospital Management**	2
Unit I	**Human Resource Management** Training and development Recruitment and selection	
Unit II	**Principles of Material Management** Basic Concept of Material Management Purchasing, Inventory, Store Records	
Unit III	**1.Principles of Quality Management** Quality Assurance and Quality Control	

	Accreditation and Audit ISO, NABL, NABH Project Work [ppt]: Educational News, New Innovations in Medical Science.	

Paper -6		
CourseCode	**Title - MS-OFFICE-2**	**Credits**
UGMITAEC405 **UNIT I**	**Avdance MS WORD** **Inserting and Editing Graphics** Adding images and shapes Adjusting image layout and text wrapping SmartArt and WordArt **Collaboration and Review Tools** Track Changes and Comments Sharing and collaborating on documents **Mail Merge** Creating a mail merge document Using data sources	2

	Previewing and completing a mail merge **Advanced Formatting and Styles** Advanced formatting options Creating and modifying styles Table of Contents and Index Protecting documents with passwords	
Unit II	**Advance Excel** **Create and Manage Tables** Create an Excel table from a cell range Convert a table to a cell range Add or remove table rows and columns **Manage Table Styles and Options** Apply styles to tables Configure table-style options Insert total rows **Filter and Sort a Table** Filter records Sort data by multiple columns Change sort order Remove duplicate records **Create Charts and Objects** Create a new chart Add additional data series Switch between rows and columns in the source data Analyze data Resize charts Add and modify chart elements Apply chart layouts and styles Move charts to a chart sheet Insert text boxes and shapes Insert images Format charts **Create Advanced Formulas** Look up data by using Functions	
Unit III	**Advance Power-point** **Insert Tables, Charts, SmartArt, and Media** Insert and Format Tables Insert and Format Charts Insert and Format SmartArt graphics Insert and Manage Media	

	Apply Transitions and Animations Apply Slide Transitions Animate Slide Content Set Timing for Transitions and Animations	

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PRACTICAL - SEMESTER-4

References:

1. iTransform Handbook on Anatomy, Physiology Jaypee brothers
2. iTransform Handbook on Foundation Program
3. iTransform Handbook on Medical Terminologies
4. iTransform Handbook on Imaging technician handbook

UGMITCP401A	**COMPUTED TOMOGRAPHY TECHNOLOGY-2** Image processing Identification & note the uses of drugs in CT Case studies	1
UGMITCP401B	**PATIENT POSITIONING & PROTOCOLS-2** consent requirements Patient preparation and postprocedure instructions	1
UGMITCP402	**DIAGNOSTIC INVESTIGATION & DISEASE** ECG machine techniques USG machine components Case studies of Communicable & Non-Communicable diseases	1
UGMITGE403	**PATIENT CARE TECHNIQUES** Tools and equipment Prevention from patient injuries	1

5. Clark Positioning Book for radiographers
6. Bhargava book for residents & technologist.
7. Procedures book Bhushan Lakkhar

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