



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A++' Accredited by NAAC

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CHOICE BASED CREDIT SYSTEM

(CBCS)

(with effect from 2018-19 Batches)

Curriculum for M.Sc. Medical Radiology & Imaging Technology

Amended upto AC-48/2023, Dated 12/12/2023

Amended History

1. Approved in BOM-53/2018 [Resolution No. 4.5.2] Dated 19/05/2018.
2. As Amended in BOM-55/2018 [Resolution No.4.13)], [Resolution No.4.4.1.2], [Resolution No.4.4.1.3], Dated 27/11/2018.
3. Approved as per BOM-57/2019, [Resolution No.3.1.4.2], [Resolution No.3.2.1.6.a], [Resolution No. 3.2.1.6.d]; Dated 26/04/2019.
4. As Amended in BOM-63/2021[Resolution No.4.3.1.2], [Resolution No.4.3.1.3.], Dated 17/02/2021.
5. As Amended in AC-41/2021 [Resolution No. 3.5]; Dated 27/08/2021
6. As Amended in AC-42/2022 [Resolution No. 10.4.i], Dated 26/04/2022.
7. As Amended in AC-48/2023 [Resolution No. 6.7], Dated 12/12/2023.

OUTLINE OF COURSE CURRICULUM														
M.Sc. Medical Radiology and Imaging Technology														
Semester I														
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (I)	Practical (P)	Clinical Posing/Rotation	Total Credits (C)	Lecture (L)	Tutorial (I)	Practical (P)	Clinical Posing/Rotation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory														
MMRIT 101 L	Conventional Radiology and Imaging Equipments	4	-	-	-	4	60	-	-	-	60	20	80	100
MMRIT 102 L	Modern Radiological and Imaging Equipment	4	-	-	-	4	60	-	-	-	60	20	80	100
MMRIT 103 L	Radiation Safety and Protection	3	-	-	-	3	45	-	-	-	45	20	80	100
MMRIT 104 CP	MRIT Directed Clinical Education - I	-	-	-	27	9	-	-	-	405	405	50	-	50
Practical														
MMRIT 101 P	Conventional Radiology and Imaging Equipments	-	-	4	-	2	-	-	60	-	60	10	40	50
MMRIT 102 P	Modern Radiological and Imaging Equipment	-	-	4	-	2	-	-	60	-	60	10	40	50
Total		11	0	8	27	24	165	0	120	405	690	130	320	450

OUTLINE OF COURSE CURRICULUM														
M.Sc. Medical Radiology and Imaging Technology														
Semester II														
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Ro tation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Ro tation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory														
MMRIT 105 L	Radiographic and Imaging Techniques	3	-	-	-	3	45	-	-	-	45	20	80	100
MMRIT 106 L	Interventional Radiological Techniques	4	-	-	-	4	60	-	-	-	60	20	80	100
MMRIT 107 L	Radiological Physics for Imaging	3	-	-	-	3	45	-	-	-	45	20	80	100
MMRIT 108 CP	MRIT Directed Clinical Education - II	-	-	-	27	9	-	-	-	405	405	50	-	50
CC 001 L	Research Methodology & Biostatistics (Core Course)	4	-	-	-	4	60	-	-	-	60	20	80	100
Practical														
MMRIT 105 P	Radiographic and Imaging Techniques	-	-	4	-	2	-	-	60	-	60	10	40	50
MMRIT 107 P	Radiological Physics for Imaging	-	-	4	-	2	-	-	60	-	60	10	40	50
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	10	40	50
Core Elective Course														
CEC 001 L	Basics of Clinical Skill Learning	3	-	-	-	3	45	-	-	-	45	100	-	100
CEC 002 L	Hospital Operation Management													
Total		17	0	12	27	32	255	0	180	405	840	260	440	700

OUTLINE OF COURSE CURRICULUM															
M.Sc Medical Radiology and Imaging Technology															
Semester III															
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks			
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation	Total hrs.	Internal Assessment	Semester Exam	Total	
Theory															
MMRIT 109 L	Radiological and Imaging Procedures	4	-	-	-	4	60	-	-	-	60	20	80	100	
MMRIT 110 L	Quality Assurance in Diagnostic Imaging	4	-	-	-	4	60	-	-	-	60	20	80	100	
MMRIT 111 CP	MRIT Directed Clinical Education - III	-	-	-	21	7	-	-	-	405	405	50	-	50	
MMRIT 112	Dissertation / Project*	10	-	-	-	5	-	-	-	-	-	50	-	50	
Practical															
MMRIT 110 P	Quality Assurance in Diagnostic Imaging	-	-	4	-	2	-	-	120	-	120	10	40	50	
Seminar															
MMRIT 113	Seminars	-	-	-	-	1	-	-	-	-	-	50	-	50	
Total		18	0	4	21	23	120	0	120	405	645	200	200	400	

OUTLINE OF COURSE CURRICULUM														
M.Sc Medical Radiology and Imaging Technology														
Semester IV														
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory (General Elective**)														
GE 001 L	Pursuit of Inner self Excellence (POISE)	4	-	-	-	4	60	-	-	-	60	100	-	100
GE 002 L	Bioethics, Biosafety, IPR and Technology Transfer													
GE 003 L	Disaster Management and Mitigation Resources													
GE 004 L	Human Rights													
Practical														
MCCT 112	Dissertation / Project	-	-	36	-	18	-	-	-	-	-	-	200	200
MCCT 114	Educational Tour / Field Work/IV/Hospital Visit	-	-	-	-	2	-	-	-	-	-	50	-	50
Total		4	0	36	0	24	60	0	0	0	60	150	200	350

DIRECTOR'S MESSAGE

Dear Students,

Greetings!!!!

I take this opportunity to welcome you on behalf of MGM family to the Masters Degree at MGM School of Biomedical Sciences (MGM SBS).

MGM School of Biomedical Sciences (MGM SBS) established in the year 2007, the MGM School of Biomedical Sciences envisaged building a progressive learning community and is committed to pursuit of excellence in higher education, total development of personality and shaping the students into sensitive, self-reliant citizens of the country imbued with the ideals of secularism and a scientific aptitude. We set global standards to make our students scientifically as well as ethically stronger. The college adopts the national qualification frame work for the post-graduate programs which has adopted Credit Base Choice System (CBCS) so that, we construct a value based system of education that encourages critical thinking and creativity, a research platform as opposed to rote learning.

The P.G (M.Sc.) courses offered are; Medical Anatomy, Medical Physiology, Medical Biochemistry, Medical Microbiology, Medical Pharmacology, Biotechnology, Genetics, Molecular Biology, Masters in Hospital administration and Biostatistics, M.Sc. Cardiac Care Technology, M.Sc. Medical Radiology and Imaging Technology, M. Optometry. Over time, the program has evolved, to meet the challenges of the ever changing field of biomedical education system.

With Best Wishes,

Director
MGM School of Biomedical Sciences

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences through meaningful and ethical research.

Vision

By the year 2020, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGM IHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well equipped labs. The school encompasses 21 courses each with its own distinct, specialized body of knowledge and skill. This includes 7 UG courses and 14 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately 581 at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, School of Biomedical Sciences envisions to continuously grow and reform. Reforms are essential to any growing institution as it fulfills our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems.

Name of the Degree:M.Sc. Medical Radiology & Imaging Technology

Duration of Study:The duration of the study for M.Sc. Medical Radiology & Imaging Technology will be of 2 years

Program pattern:

- First Semester: July
- Second Semester: January
- Third Semester: July
- Fourth Semester: January

Eligibility Criteria:

B.Sc. in Medical Radiology & Imaging Technology/B.Sc. Medical Technology Radio diagnosis and Imaging/ B.Sc. Radiological Technology/B.Sc. in Radiography/B.Sc. Medical Technology (X-ray) with a minimum 50% marks in B.Sc.

Medium of Instruction:

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

For any query visit the website: www.mgmsbsnm.edu.in

Programme Outcome:

- Students are expected to have an understanding of and implement various advanced image processing algorithms and analyse their performance on datasets to make improvements.
- This is achieved through a series of hands on assignments and projects.

Programme Specific Outcome:

After taking this course...

- The student will learn principles of tomographic imaging with different modalities such as x-ray, PET and SPECT, NMR/MRI, ultra sound and optical with non-diffracting and diffracting energy sources.
- Learn principles of non-invasive medical imaging techniques and non destructive techniques for industrial imaging.
- After completion of this curriculum, a Medical Radiology & Imaging Technologist gets opportunities to work at various health care institutes under designations as:
 - Radiographer
 - Radiological Technologist
 - X-ray Technologist
 - CT scan Technologist
 - MRI Technologist
 - Mammography Technologist
 - Cathlab Technologist
 - Ultrasonography Technologist
 - Applications Specialist
 - Radiological Safety Officer
 - Interventional Technologist
 - Quality control Technologist
 - PACS manager
 - Sales and marketing of radiology industry
 - Diagnostic Manager
 - Teaching & research faculty in Medical colleges

FIRST YEAR

M.Sc. Medical Radiology & Imaging Technology

SEMESTER-I

Code No.	Core Subjects
Theory	
MMRIT101L	Conventional Radiology and Imaging Equipment
MMRIT 102 L	Modern Radiological and Imaging Equipment
MMRIT103 L	Radiation Safety and Protection
MMRIT 104 L	MRIT Directed Clinical Education - I
Practical	
MMRIT 101 P	Conventional Radiology and Imaging Equipment
MMRIT 102 P	Modern Radiological and Imaging Equipment

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Conventional Radiology and Imaging Equipment
Course Code	MMRIT 101 L

Teaching Objective	<ul style="list-style-type: none"> To educate the student in Basic Physics as applied to procedures in Medical Imaging like X-Ray, Ultrasonography, Computed Tomography & Magnetic Resonance Imaging Production of x rays. Quality and quantity of radiation and its application in radiology
Learning Outcomes	<ul style="list-style-type: none"> After successful accomplishment of the course, the students would be able to describe the applied physics and correlate it with technical procedures. Students should understand Concepts of Physics to be applied for learning various Imaging Modalities. The student must able to correlate the knowledge with the technical procedures

Sr.No.	Topics	No. of Hrs.
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, rotating anode x - ray tube: construction, working rating, speed of anode rotation, anode heel effect	10
2	High tension circuits: H.T. generator for x-ray machines, three phase rectifier circuits, high and medium frequency circuits; mains voltage compensator, kV compensator, space charge compensation, high tension selector switch, filament circuit	10
3	Fluoroscopy: Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, tilting table, Image intensifier - Construction and working, advantages over fluoroscopic device, basic principles of closed circuit television camera and picture tube, Automatic brightness control, automatic exposure control, Manual cassette changer, basic principles of cine fluoroscopy	15
4	X-ray Units: Portable and mobile x-ray units, dental x-ray unit, skull unit. Mammography unit- Technical aspects of Mammography	10
5	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, tube stands and tracks as well as accessory equipment.	15
Total		60 hrs

MMRIT 101 P - Conventional Radiology and Imaging Equipment

Sr.No.	Topics	No. of Hrs
1	Cross sectional diagram of X-ray Film, Cross sectional diagram of Intensifying Screen, Characteristic Curve, X-ray Tube, Fluoroscopy	60
Total		60 hrs

Reference Books:

1. The Physics of Diagnostic Imaging, 1st Edition, 1998, Dowsett, Kenny Johnston.
2. Physical Principles of Diagnostic Radiology, Sprawls
3. Radiological Science for Technologist: Physics, Biology and Protection, 8th Edition, 2004, Bushong, Stewart C
4. MRI in Practice, 3rd Edition, 2005, Westbrook, Rath.
5. X-ray Physics and Equipment, Ashuworth.
6. Computed Radiography, M J Brooker.

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Modern Radiological and Imaging Equipment
Course Code	MMRIT 102 L

Teaching objective	<ul style="list-style-type: none"> To competently handle the specialized imaging equipment's i.e. CT scan, MRI, Mammography and Angiographic equipment's and their related accessories. Demonstrate good understanding of the normal anatomy and common pathological conditions on the images obtained using these special equipment. Should take all precautions in the protection of staff and patient. Should have knowledge of the advantages and limitations of the each equipment
Learning outcomes	<ul style="list-style-type: none"> After successful accomplishment of the course, the students would be able to describe the applied physics and correlate it with technical procedures. The student must be able to correlate the knowledge with the technical procedures

Sr.No.	Topics	No. of Hrs.
1	High Frequency X-Ray Generators and their types and applications, Modern x-ray tubes -their types and advancements.	10
2	Special radiological equipment: Computed radiography: its principle, physics & equipment. Digital Radiography, Digital Fluoroscopy, Digital Mammography;	10
3	Tomography: Body section radiography, basic principle and equipment, multi section tomography, various types of topographic movements,	10
4	Scatter radiation its formation and control: beam centering devices, collimators, cone diaphragms and grids.	10
5	Computed Tomography: Principle, data acquisition concepts, image reconstruction, instrumentations, image manipulation Historical developments - Various generations, spiral/helical, single slice/multislice CT, Electron beam CT, mobile CT, Advances in volume scanning, continuous, sub second scanning. Real time CT fluoroscopy, interventional guidance tool, 3D CT, CT angiography. Virtual reality imaging, including image quality and quality control in CT Scanners.	10
6	MRI: Basic principle of MRI, complete imaging equipment and various requirements, T1 and T2 Relaxation behaviors of tissues, T1, T2 and proton density images, spatial localization of images. Types of imaging sequences (spin echo, fast spin echo, flash, inversion recovery, gradient echo. MR spectroscopy, principle and techniques, Contrast Agents in MRI, Image quality, Image artefacts and its compensators, NMR hazard and safety. Advances in MRI)	10
Total		60 hrs

MMRIT 102 P - Modern Radiological and Imaging Equipment

Sr. No.	Topics	No. of Hrs
1	Imaging techniques of CT scan, Imaging techniques of MRI, Imaging techniques in Interventional radiology, Imaging techniques in Mammography, Imaging techniques in CR, Imaging techniques in DR.	60
Total		60hrs

Reference Books:

1. X-ray Physics and Equipment, Ashuworth.
2. Radiographic Imaging, 4th Edition, 1987, D N Chesney, M O Chesney.
3. MRI in Practice, 3rd Edition, 2005, Westbook, Rath.
4. Merrill's Atlas of Radiographic Positioning & Procedures, 11th Edition, 2007, Frank, long, Smith.

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Radiation Safety and Protection
Course Code	MMRIT 103 L

Teaching Objective	<ul style="list-style-type: none"> On completion of this subject, students shall be able to apply basic methods of radiation protection in diagnostic radiology. Should take all precautions in the protection of staff and patient
Learning Outcomes	<ul style="list-style-type: none"> This will make the students aware about the Safety required in the Radiology Dept. This Subject will teach them about the Dose limits required for the Patients and the Technologist.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Radiation protection: Need for protection, Aim of radiation protection.	5
2	Limits for radiation exposure: Concept of ALARA, maximum permissible dose, exposure in pregnancy, children. Occupational Exposure Limits – Dose limits to public	5
3	Radiation Protection in: Radiography, Fluoroscopy, Mammography, Mobile Radiography, CTScan, DSA and Interventional Radiology.	5
4	Radiation measuring instruments: survey meters, area monitor, personnel dosimeters, film badge, thermo luminescent dosimeter, pocket dosimeter.	10
5	Radiation protection, Hazard evaluation and control: Philosophy of Radiation protection, Radiation protection of self and patient and General Public, Principles of radiation protection, time – distance and shielding, weekly calculated dose to radiation worker & General public Good work practice in Diagnostic Radiology.	10
6	Newer Radiation safety protocols and recent advances in radiation safety: Role of Radiographer in Planning & 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/CT rooms, Inspection of X-Ray installations	10
Total		45 hrs

Reference Books:

1. Radiological Science for Technologist: Physics, Biology and Protection, 8th Edition, 2004, Bushong, Stewart C.
2. Safety code for medical diagnostic x-ray equipment and installations, 1986, Radiological Safety Division, AERB.
3. Radiological safety in Enclosed Radiography installations, 1986, Radiological Safety Division, AERB.
4. Protection of the Patient in Diagnostic Radiology, AERB, AERB.
5. Radiation protection of the Patient, Walter A Langmead.

MMRIT 104 CP Directed Clinical Education – I

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

(Total -405 hrs)

FIRST YEAR

B.Sc. Medical Radiology & Imaging Technology

SEMESTER- II

Code No.	Core Subjects
Theory	
MMRIT 105 L	Radiographic and Imaging Techniques
MMRIT 106 L	Interventional Radiological Techniques
MMRIT 107 L	Radiological Physics for Imaging
MMRIT 108 L	MRIT Directed Clinical Education - II
CC 001 L	Research Methodology& Biostatistics (Core Course)
Practical	
MMRIT 105 P	Radiographic and Imaging Techniques
MMRIT 107 P	Radiological Physics for Imaging
CC 001 P	Research Methodology & Biostatistics (Core Course)
Core Elective Course	
CEC 001L	Basics of Clinical Skills Learning
CEC 002L	Hospital Operation Management

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Radiographic and Imaging Techniques
Course Code	MMRIT 105 L

Teaching Objective	<ul style="list-style-type: none"> To enable the students to interpret the radiographic images & find out the abnormalities if any like fractures, tumors etc. To help students have a better understanding of the medical conditions and to perform the duties more efficiently. To help students to produce better images and understand the images when produced
Learning Outcomes	<ul style="list-style-type: none"> The students will be able to know the normal structure of the skeletal system and be able to correlate the abnormalities in diseased. The students will be able to diagnose abnormalities, diseases, physiological and pathological conditions on X-rays.

Sr. No.	Topics	No. of Hrs.
1	Upper Limb: Technique for hand, fingers, thumb, wrist joint carpal bones, forearm, elbow joint, radio ulnar joints and humerus supplementary techniques for the above. Eg. carpal tunnel view, ulnar groove, head of the radius, supracondylar projections.	10
2	Lower limb: Technique for foot, toes, tarsal bones, Calcaenum, ankle joint, lower leg, knee, patella & femur. Supplementary techniques: Subtalar joint and talo calcaneal joint. Inter condylar projection of the knee. Length measurement technique.	10
3	Shoulder girdle and Thorax: Technique for shoulder joint, scapular, clavicle, acromio clavicular joints, sternum, ribs, sterno-clavicular joint. Supplementary projections and techniques for recurrent dislocation of shoulder. Traumatic dislocation of shoulder.	10
4	Vertebral column: Technique for cervical spine, cervico thoracic spine, thoracic spine, thoraco- lumbar spine, lumbo sacral spine, sacrum and coccyx.	5
5	Pelvic girdle and hip region: Technique for whole pelvis. Ilium, ischium, pubic bones, sacro iliac joint, symphysis pubis, hip joint, Lateral projections for hip joints to show femoral head	5
6	Skeletal survey: Skeletal survey for metabolic bone disease, Different views associated, High KV techniques: Principle and its applications.	5
Total		45 hrs

MMRIT 105 P - Radiographic and Imaging Techniques

Sr. No.	Topics	No. of Hrs
1	Upper Limb, Lower Limb, Shoulder Girdle and Thorax, Pelvis and Hip, Skeletal Survey, Vertebral Column	60
Total		60 hrs

Reference Books:

1. Radiographic Imaging, 4th Edition, 1987, D N Chesney, M O Chesney.
2. Principles of Radiographic Imaging, 3rd Edition, 2001, Carlton, Adler.
3. The Science of Photography, Braines H.
4. Clark's positioning in Radiology, 12th Edition, 2005, Clark.
5. Medical X-ray Techniques in Diagnostic Radiology, Vander Plaals
6. Radiographic Anatomy and Positioning: An integrated approach, 1998, Comuelle, Andrea Gauthier
7. Special Techniques in Orthopedic Radiology, Strip

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Interventional Radiological Techniques
Course Code	MMRIT106 L

Teaching Objective	<ul style="list-style-type: none"> • Apply the principles of basic science and evidence-based practice • Use relevant investigations as needed • Identify the indications for basic procedures and perform them in an appropriate manner • Incorporate strategies for health promotion and disease prevention with their patients
Learning Outcomes	<ul style="list-style-type: none"> • The students will be able to help the doctors in the interventional procedure • They will be able to guide in the procedures for the doctors and will learn on the catheters and their types and will be able to know about the different procedures,

Sr. No.	Topics	No. of Hrs.
1	Basic Angiography and DSA: History, technique, patient care, Percutaneous catheterization, catheterization sites, Asepsis ,Guide wire, catheters, pressure injectors, accessories, use of digital subtraction- single plane and bi-plane. All forms of diagnostic procedures including angiography, angioplasty, biliary examination, renal evaluation and drainage procedure under flouro, CT guidance	10
2	Central Nervous System: Myelography. Cerebral studies, Ventriculography.	10
3	Arthrography: Shoulder, Hip, Knee, Elbow	10
4	Angiography: Carotid Angiography (4 Vessel angiography).Thoracic and Arch Aortography. Vertebral angiography, femoral arteriography. Selective studies: Renal, SMA, Coeliac axis. Angiocardiography.	10
5	Venography: Peripheral venography, Cerebral venography, Inferior and superior venocavography. Relevant visceral phlebography.	10
6	Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker.	10
Total		60 hrs

Reference Books:

1. Interventional Radiology, 2nd Edition, 2005, Kessel , Lain Robertson
2. Computed Radiography for Radiographers, 1986, M J Brooker.
3. Essentials of Nuclear Medical Imaging, 5th Edition, 2006, Mettler, Guibertean
4. Merrill's Atlas of Radiographic Positioning & Procedures, 11th Edition, 2007, Frank, long, Smith.

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Radiological Physics for Imaging
Course Code	MMRIT107 L

Teaching Objective	<ul style="list-style-type: none"> • To educate the student in Basic Physics as applied • to procedures in Medical Imaging like X-Ray, Ultrasonography, Computed Tomography & Magnetic Resonance Imaging • Production of x rays. Quality and quantity of radiation and its application in radiology.
Learning Outcomes	<ul style="list-style-type: none"> • After successful accomplishment of the course, the students would be able to describe the applied physics and correlate it with technical procedures. Students should understand Concepts of Physics to be applied for learning various Imaging Modalities. • The student must able to correlate the knowledge with the technical procedures

Sr. No.	Topics	No. of Hrs.
1	Physics of Imaging- Including conventional radiography, computed radiography and flat panel DR imaging.	5
2	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.	10
3	Advanced Computed Tomography- CT artefact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose Index.	10
4	MRI- Basic Principles- Spin – precession – relaxation time – pulse cycle – T1 weighted image – T2 weighted image – proton density image. Pulse sequence: Inversion recovery sequence – STIR sequence – SPIR sequence – FLAIR sequence – Echo planar imaging – Advanced pulse sequences, MR Spectroscopy – functional MRI, MR Instrumentation: Types of magnets – RF transmitter – RF receiver – Gradient coils – shim coils – RF shielding – computers.	10
5	Ultrasonography- Basic Acoustics, Ultrasound terminologies: acoustic pressure, power, intensity, impedance, speed, frequency, Interaction of US with matter: reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients, Production of ultrasound: Piezoelectricity, Medical ultrasound transducer: Principle, construction and working,	10
Total		45 hrs

MMRIT 107 P - Radiological Physics for Imaging

Sr. No.	Topics	No. of Hrs.
1	Student should prepare a journal which will contain the procedures adopted in Imaging Radiographs-Cross sectional diagram of X-ray Film, Cross sectional diagram of Intensifying Screen, Characteristic Curve, X-ray Tube, CT Scan, MRI	60
Total		60 hrs

Reference Books:

1. The Physics of Diagnostic Imaging, 1st Edition, 1998, Dowsett, Kenny Johnston.
2. Physical Principles of Diagnostic Radiology, Sprawls.
3. Essential Physics for Radiographers, Ball, Moor.
4. Radiological Science for Technologist: Physics, Biology and Protection, 8th Edition, 2004, Bushong, Stewart C.
5. X-ray Physics and Equipment, Ashuworth.
6. Computed Radiography, M J Brooker.
7. The Fundamentals of X-ray and radium Physics, 6th Edition, Selman.
8. The MRI Manual, 2nd Edition, 1998, Robert b Lufkin.
9. Clinical Sonography, A Practical guide, 1998, Roger C Sanders.
10. MRI in Practice, 3rd Edition, 2005, Westbook, Rath.

MMRIT 108CP Directed Clinical Education – II

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.

(Total – 405 hrs)

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Research Methodology & Biostatistics (Core Course)
Course Code	CC 001 L

Teaching Objective	The course is intended to give an overview of research and statistical models commonly used in medical and bio-medical sciences. The goal is to impart an intuitive understanding and working knowledge of research designs and statistical analysis. The strategy would be to simplify, analyse the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.
Learning Outcomes	Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis interpretation & reporting of results and use of statistical software.

Sr. No.	Topics	No. of Hrs.
A	Research Methodology:	
1	Scientific Methods of Research: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research, Research Methods versus Methodology, Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report	5
2	Research Designs: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case Control Studies, Cross sectional studies, Intervention studies, Panel Studies.	5
3	Sampling Designs: Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs (Probability sampling and non probability sampling), How to Select a Random Sample?, Systematic sampling, Stratified sampling, Cluster sampling, Area sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5
4	Measurement in research: Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Possible sources of error in measurement, Tests of sound measurement	5
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data	5
6	Sampling Fundamentals : Need and importance for Sampling, Central Limit Theorem, Sampling Theory, Concept of Standard Error, Estimation, Estimating the Population Mean Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level.	5
B	Biostatistics	
7	Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and	3

	continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter plots, line graphs	
8	Measures of Central Tendency and Dispersion: Mean, Median, Mode Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3
9	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Normal distribution, data transformation Important Parametric Tests, Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Hypothesis Testing for Comparing a Variance to Some Hypothesized Population Variance, Testing the Equality of Variances of Two Normal Populations.	6
10	Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi-square Test, Alternative Formula, Yates' Correction, and Coefficient by Contingency.	2
11	Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis	2
12	Analysis of Variance and Covariance: Analysis of Variance (ANOVA): Concept and technique of ANOVA, One-way ANOVA, Two-way ANOVA, ANOVA in Latin-Square Design Analysis of Co-variance (ANOCOVA), ANOCOVA Technique.	4
13	Nonparametric or Distribution-free Tests: Important Nonparametric or Distribution-free Test Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test Kruskal Walli's test, Friedman's test, and Spearman Correlation test.	3
14	Vital Health Statistics: Measurement of Population: rate, crude rate, specific rate, Measurement of fertility: specific fertility rate, Total fertility rate, Reproduction rate, Gross Reproduction Rate, Net Reproduction Rate, Measures related to mortality: Crude Death Rate (CDR), Age-specific death Rate, Infant and child mortality rate, Measures related to morbidity.	4
15	Computer Application Use of Computer in data analysis and research, Use of Software and Statistical package. Introduction to SPSS. Importing data from excel, access, tab and comma separated files. Entering data, labeling a variable, coding and recoding a categorical and continuous variable. Converting data from string to numeric variables, sorting & filtering, merging, appending data sets. Frequencies, descriptive statistics, cross tabulations. Diagrammatic presentation include histogram, bar chart, pie chart, scatter diagram, box plot, line chart. Parametric test of hypothesis-one sample, Independent and paired sample t test, one way ANOVA & post HOC test. Testing for normality, Chi-square test with measures of association. Pearson correlation. Non parametric test.	3
Total		60 hrs

CC 001P –Research Methodology & Biostatistics

Sr. No.	Topics	No. of Hrs
A	Research Methodology	
1	Sampling Designs	4
2	Measurement in research	5
3	Methods of Data Collection	3
4	Sampling Fundamentals	3
B	Biostatistics	
5	Data Presentation	4
6	Measures of Central Tendency and Dispersion	4
7	Testing of Hypotheses	12
8	Chi-square Test	2
9	Measures of Relationship	3
10	Analysis of Variance and Covariance	4
11	Nonparametric or Distribution-free Tests	4
12	Vital Health Statistics: Measurement of Population	6
13	Computer Application Using Statistical Software	6
Total		60 hrs

CORE ELECTIVE COURSES

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Basics of Clinical Skill Learning
Course Code	CEC 001L

Teaching Objective	<ul style="list-style-type: none"> To Understand the basic ideas on how to check for Vital Signs of the Patient In this course the Student will learn how to handle the patients and their positioning They will also learn on the Basics of Nasal-Gastric Tube The Students will learn on Administration of IV, IV and Medication Also they will know about Cleanliness in the Asepsis
Learning Outcomes	<ul style="list-style-type: none"> After successful accomplishment of the course, the students would be able to Measure Vital Signs, do basic physical Examination of the patients, NG tube basics, Administration of Medicines The students will learn about Asepsis, and the Cleanliness related to asepsis and on mobility of the patients

Sr. No.	Topics	No. of Hrs.
1	Measuring Vital Signs -Temperature: Axillaries Temperature, Pulse: Sites of pulse, Measurement, Respiratory, Blood Pressure, Pain: Pain Scale	5
2	Physical Examination -Observation, Auscultation(Chest), Palpation, Percussion, History Taking	10
3	Feeding: Enteral feeding, NG Tube -Measurement, Procedure, Care, Removal of Nasal-Gastric Tube, Nasal-Gastric Tube Feeding, and Parenteral Nutrition.	10
4	Administrations -Oral, Intravenous, Intramuscular, Subcutaneous, Recapping of Syringe, Loading of Drugs, Calculation of Drugs, Venipuncture, IV Infusion, Cannula, Attachment of IV infusion Set , Fluid Collection, Heparin Lock, Maintenance of IV set, Performing Nebulizer Therapy, Inhaler, Oxygen Therapy (Nasal, prongs, nasal Catheter, Venturi Mask, face mask)	10
5	Asepsis -Hand wash Techniques,(Medical, Surgical) Universal Precaution, Protecting Equipment: Using Sterile Gloves, Opening a Sterile package and Establishing a Sterile Field, Sterile Dressing Changes, Surgical Attire ,Wound Dressing, Suture Removal, Cleaning and Application of Sterile Dressing, Wearing and Removal of personal protective Equipment	5
6	Mobility and Support: Moving and Positioning, range of Motion exercises (Active & Passive) Assisting for Transfer, Application of Restraints	5
Total		45 hrs

CORE ELECTIVE COURSES

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Hospital Operation Management
Course Code	CEC 002L

Teaching Objective	<ul style="list-style-type: none"> • To promote scientific management of hospital and advancement of health care systems so as to make it rational, responsive and cost efficient • To promote the development of high quality of hospital care in the community and the country. • It has to provide a satisfactory environment to the patient and also to the doctors for clinical research.
Learning Outcomes	<ul style="list-style-type: none"> • Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors • Communicate effectively and develop their leadership and teambuilding abilities • Apply modern change management and innovation management concepts to optimize structures • Analyze existing hospital service policies and enhance their alignment within the local and national context.

Sr. No.	Topics	No. of Hrs.
1	Medico-Legal cases: Introduction, Laws associated with Medico-Legal Cases, Three Core Contents in Medico-legal cases w.r.t Doctors, Patient & Profession	05
2	Considerations of Ethics: Consent, Confidentiality, Mental Health, End of life and Organ Transportation, Research & Clinical Trials	10
3	Hospital Information System(HIS): Hospital Information System Management, software applications in registration, billing, investigations, reporting, medical records management, Security and ethical challenges	10
4	Equipment Operations management: Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS	10
5	Role of Medical records in Health care management: Computers for Medical records, Developments of computerized medical record information processing system(EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual	10
Total		45 hrs

SECOND YEAR

M.Sc. Medical Radiology & Imaging Technology

SEMESTER-III

Code No.	Core Subjects
Theory	
MMRIT 109 L	Radiological and Imaging Procedures
MMRIT 110 L	Quality Assurance in Diagnostic Imaging
MMRIT 111 CP	MRIT Directed Clinical Education - III
MMRIT 112	Dissertation/Project
Practical	
MMRIT 110 P	Quality Assurance in Diagnostic Imaging
Seminar	
MMRIT 113	Seminars

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Radiological and Imaging Procedures
Course Code	MMRIT 109 L

Teaching Objective	<ul style="list-style-type: none"> On completion of this subject, students shall be able to gain the knowledge about basic and technological aspects of Special procedures in Radiology. It will Give them an Idea on how to work with Sterility in Procedures and on how the procedures are performed under Fluoroscopy and in Interventional radiology
Learning Outcomes	<ul style="list-style-type: none"> After successful accomplishment of the course, the Students will know about the procedures performed in Interventional Radiology and in Fluoroscopy. The Procedures such as RGU, MCU, IVU, PTBD, ERCP, IPTC Etc

Sr. No.	Topics	No. of Hrs.
1	Fluoroscopy Equipment and General Considerations: Selection of Fluoroscopy Equipment, general considerations, responsibility of radiographers. Patient Preparation, Indications Contraindications Technique Post Care and Preparation of Drug Trolley/Tray, Radiation Safety. Contrast Media - Positive and Negative, Ionic & Non – Ionic, Adverse Reactions To Contrast Media and Patient Management, Emergency Drugs in the Radiology Department ,Aseptic technique for the following procedures.	15
2	Gastrointestinal Tract: Barium swallow, pharynx and oesophagus. Barium meal and follow through. Barium Enema, double contrast studies, Special techniques for specific disease to be examined. Including water soluble contrast media - e.g. gastrograffin studies	15
3	Salivary glands: Routine technique, procedure - sialography.	10
4	Urinary system: Intravenous urography, retrograde pyelography, Cystography and micturating cystourethrography. Urethrography (ascending), Including CT.	10
5	Reproductive system: All the Techniques relating to Male and Female reproductive system including Hysterosalpingography.	10
Total		60 hrs

Reference Books:

1. Merrill's Atlas of Radiographic Positioning & Procedures, 11th Edition, 2007, Frank, long, Smith.
2. Clark's positioning in Radiology, 12th Edition, 2005, Clark.
3. Radiological Procedures, 1st Edition, 2004, Bhargava S K
4. Double Contrast GI, 2nd Edition, Laufer, Levine
5. Myelography, 2nd Edition, Skalpe, Sortland
6. Interventional Radiology, 2nd Edition, 2005, Kessel , Lain Robertson

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Name of the Course	Quality Assurance in Diagnostic Imaging
Course Code	MMRIT 110 L

Teaching Objective	<ul style="list-style-type: none"> Students can do the quality assurance tests of the equipment and accessories with the help of simple test tools. They will know how to keep the films stored and chemicals and also know how to handle the chemicals. They will know about the darkroom Layout.
Learning Outcomes	<ul style="list-style-type: none"> After successful accomplishment of the course, the students would be able to do quality assurance of the machines and the Equipment. The student must able to correlate the knowledge with the technical procedures.

Sr. No.	Topics	No. of Hrs.
1	Planning of Radio-diagnosis Department: Location of the department, Adjacent department and areas, Basics of the imaging rooms, Patient waiting areas, Basics infrastructures of the imaging rooms	15
2	Quality Assurance in Radio diagnosis: Aim of quality assurance in medical imaging, Q.A. Program	10
3	Accessory equipment: Collimator, Cassettes and Intensifying screens, Grid, Lead rubber aprons and gloves, Viewing box, Patient positioning aids, Patients measuring calipers	15
4	X-ray equipment: Choosing x-ray equipments, Acceptance of new x-ray equipments, Generator, X-ray tube, column, table, potter bucky and upright bucky, Portable and mobile x-ray units	15
5	Manual film processing: The darkroom, Film and chemical storage, Film processing	5
Total		60 hrs

MMRIT 110 P - Quality Assurance in Diagnostic Imaging

Sr. No.	Topics	No. of Hrs
1	Tests to check light leakage in the cassette.	120
2	White light leakage test.	
3	Safelight efficiency test.	
4	Film/screen contact test.	
5	Sensitometry test using an aluminum step wedge.	
6	Collimator accuracy of scale test.	
7	Light beam/x-ray beam alignment test.	
8	Film/screen compatibility – color of light emission test.	
9	Grid line damage and grid movement test.	
10	Test to detect cracking of lead aprons and gloves.	
11	Accuracy of timer and kVp test.	
12	Test alignment of x-ray beam to upright bucky.	
13	Cassette centered to the middle of the bucky test.	
14	Central ray centered to the middle of the bucky test	
Total		120 hrs

Reference Books:

1. Quality Assurance Workbook, 2004, Peter J. Lloyd
2. Assurance of Quality on Diagnostic X-ray Dept, J A Gannett et al
3. Positioning and Quality Control, Mammography Today for Radiographers, 1992, Rickard, Wilson, Ferris, Blackett.
4. Computed Tomography: Physical Principles, Clinical Applications, and Quality Control, 2009, Seeram, Euclid
5. Fuch's principles of radiographic Exposures, processing and quality Control, Carroll, Quinn B

MMRIT 111 CP Directed Clinical Education – III

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

Total : 405 hrs

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	MMRIT 112
Name of the Course	DISSERTATION/PROJECT

****The Dissertation work will begin from 3rd Semester, and will continue through the 4th Semester.**

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	MMRIT 113
Name of the Course	Seminar

For Seminar/Presentations there will be a maximum of 50 marks. Seminar / presentations will be evaluated by the teachers of the dept. The marks obtained in the same will be kept confidentially with the Head of the Dept. and will be submitted along with the internal assessment marks.

SECOND YEAR

M.Sc. Medical Radiology & Imaging Technology

SEMESTER-IV

Code No.	Core Subjects
Theory (General Elective**)	
GE 001 L	Pursuit of Inner Self Excellence (POISE)
GE 002 L	Bioethics, Biosafety, IPR & Technology transfer
GE 003 L	Disaster management and Mitigation resources
GE 004 L	Human rights
MMRIT 112	Dissertation / Project
Practical	
MMRIT 114	Educational Tour / Field Work/IV/ Hospital Visits

*(a) **Dissertation / Project Course** commences in III Semester

(b) **Educational Tour / Field Work/ IV/ Hospital Visit** Course may be carried out in any Semester or all Semesters but evaluated and Grade Points are to be added in 4th Semester.

(Elective): Any one subject is to be chosen from the following (Subjects offered may change from time to time depending on the availability of expertise)

**Elective courses may or may not have practical and/or field work.

▲ Multidisciplinary / Interdisciplinary

Educational Tour / Field Work/ IV/ Hospital Visit:

Industrial visit has its own importance in building a career of a student which is pursuing a professional degree. Objections of industrial visit are to provide students an insight regarding internal working of reputed hospitals and labs. Industrial visits provides students an opportunity to learn practically thoughts interactions, working methods and employment practices as theoretical knowledge is not enough for making a competent and skilful professionals.

**ACADEMIC SYLLABUS FOR SEMESTER - IV
ELECTIVE COURSE**

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	GE 001 L
Name of the Course	PURSUIT OF INNER SELF EXCELLENCE (POISE)

Course objective	<ol style="list-style-type: none"> 1. To inculcate moral values in students – Self-Discipline , Time Management, Develop attitude of Service with humility, Empathy, Compassion, brotherhood, Respect for teachers, colleagues & society members. 2. Develop Effective means of communication & presentation skills in students 3. To develop wisdom in students for deciding their career based on their areas of interest and inner skills. 4. Introduce techniques for Relaxation, Meditation & Connecting with innerself. 5. Rejuvenation Techniques which can be used by students to distress themselves 6. To improve performance of students during various assignments, projects, elocutions, events, quiz, interviews.
Course outcomes	<ol style="list-style-type: none"> 1. Students will become self dependent, more decisive and develop intuitive ability for their study and career related matter. 2. Students ability to present their ideas will be developed. 3. Enhanced communication skills, public speaking & improved Presentation ability. 4. Students will be able to explore their inner potential and inner ability to become a successful researcher or technician & hence become more focused. 5. Students will observe significant reduction in stress level. 6. With the development of personal attributes like Empathy, Compassion, Service, Love & brotherhood , students will serve the society and industry in better way with teamwork and thus grow professionally.

Unit no.	Topics	No. of Hrs.
1	Spiritual Values for human excellence : The value of human integration; Compassion, universal love and brotherhood (Universal Prayer) ; Heart based living ; Silence and its values, Peace and non-violence in thought, word and deed ; Ancient treasure of values - Shatsampatti , Patanjali's Ashtanga Yoga , Vedic education - The role of the Acharya , values drawn from various cultures and religious practices - Ubuntu, Buddhism, etc.; Why spirituality? Concept – significance ; Thought culture	15
2	Ways and Means : Correlation between the values and the subjects ; Different teaching techniques to impart value education; Introduction to Brighter Minds initiative; Principles of Communication; Inspiration from the lives of Masters for spiritual values - Role of the living Master	15
3	Integrating spiritual values and life: Relevance of VBSE (Value Based Spiritual Education) in contemporary life ; Significant spiritual values ; Spiritual destiny ; Principles of Self-management; Designing destiny	15
4	Experiencing through the heart for self-transformation (Heartfulness Meditation): Who am I? ; Introduction to Relaxation; Why, what and how HFN Meditation?; Journal writing for Self-Observation ; Why, what and how HFN Rejuvenation (Cleaning)? ; Why, what and how HFN connect to Self (Prayer)?; Pursuit of inner self excellence ; Collective Consciousness-concept of <i>egregore effect</i> ;	15
Total		45 hrs

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	GE 002 T
Name of the Course	BIOETHICS, BIOSAFETY, IPR & TECHNOLOGY TRANSFER

Course objective	<p>The students will gain structural knowledge on:</p> <ol style="list-style-type: none"> 1. To list the routes of exposure for a pathogen to a human being . 2. To demonstrate and assess the proper use of PPE, best practices, biological containment, and be prepared to safely conduct research 3. To identify the role of the Biosafety Professional in Biomedical Research Laboratories 4. To appreciate the importance of assertion in interpersonal communication and be introduced to some key assertion strategies 5. To understand the interpersonal nature of giving feedback, receiving criticism and resolving conflicts. 6. To establish attentive listening as an assertion strategy
Course outcomes	<p>Students will learn to:</p> <ol style="list-style-type: none"> 1. Effectively manage the health and safety aspects of a biological laboratory. 2. Give reliable, professional and informed advice and information to colleagues and managers. 3. Help to ensure that their institution complies with relevant legislation, liaise effectively with enforcing authorities and be aware of the penalties for failing to comply. 4. Build a context of understanding through communication. 5. Mediate between other conflicting parties. 6. Exhibit de-escalatory behaviors in situations of conflict. 7. Demonstrate acknowledgment and validation of the feelings, opinions, and contributions of others.

Unit no.	Topics	Hours allotted 60hrs
1	Ethics: Benefits of Allied Health Sciences, ELSI of Bioscience, recombinant therapeutic products for human health care, genetic modifications and food consumption, release of genetically engineered organisms, applications of human genetic rDNA research, human embryonic stem cell research.	15 hrs
2	Patenting: Patent and Trademark, Bioscience products and processes, Intellectual property rights, Plant breeders rights, trademarks, industrial designs, copyright biotechnology in developing countries. Biosafety and its implementation, <i>Quality control in Biotechnology</i> .	15 hrs
	Introduction to quality assurance, accreditation & SOP writing : Concept of ISO standards and certification , National regulatory body for accreditation, Quality parameters, GMP & GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clonical and testing laboratory	15 hrs
3	Funding of Agencies (Financing alternatives, VC funding, funding for Bioscience in India, Existstrategy, licensing strategies, valuation), support mechanisms for entrepreneurship (Bio-entrepreneurship efforts in India, difficulties in India experienced, organizations supporting growth, areas of scope, funding agencies in India, policy initiatives), Role of knowledge centers and R&D (knowledge centers like universities and research institutions, role of technology and up gradation)	15 hrs

Reference Books:

1. www.pdfdrive.net
2. www.khanacademy.org
3. www.acadeicearths.org
4. www.edx.org
5. www.open2study.com
6. www.academicjournals.org

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	GE 003 T
Name of the Course	DISASTER MANAGEMENT AND MITIGATION RESOURCES

Course objective	<p>The course will uplift about:</p> <ol style="list-style-type: none"> 1. Understand and appreciate the specific contributions of the Red Cross/Red Crescent movement to the practice and conceptual understanding of disaster management and humanitarian response and their significance in the current context. 2. Recognize issues, debates and challenges arising from the nexus between paradigm of development and disasters. 3. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. 4. Respond to disaster risk reduction initiatives and disasters in an effective, humane and sustainable manner.
Course outcomes	<p>At the successful completion of course the student will gain:</p> <ol style="list-style-type: none"> 1. knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences. 2. Knowledge and understanding of the International Strategy for Disaster Reduction (UN-ISDR) and to increase skills and abilities for implementing the Disaster Risk Reduction (DRR) Strategy. 3. Ensure skills and abilities to analyse potential effects of disasters and of the strategies and methods to deliver public health response to avert these effects.

Unit no.	Topics	Hours allotted 60hrs
1	Introduction: Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.	08 hrs
2	Natural Disaster and Manmade disasters: Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	15 hrs
3	Disaster Management, Policy and Administration: Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management. Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	12 hrs
4	Financing Relief Measures: Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events.	13 hrs
5	Preventive and Mitigation Measures: Pre-disaster, during disaster and post-disaster measures in some events in general structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	12 hrs

Reference Books:

1. ShailendraK.Singh : Safety & Risk Management, Mittal Publishers
2. J.H.Diwan : Safety, Security & Risk Management, APH
3. Stephen Ayers & Garmvik: Text Book of Critical Care, Holbook and Shoemaker
4. www.pdfdrive.net
5. www.khanacademy.org
6. www.acadeicearths.org
7. www.edx.org
8. www.open2study.com
9. www.academicjournals.org

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	GE 004 T
Name of the Course	HUMAN RIGHTS

Course objective	<p>Students will comprehend on:</p> <ol style="list-style-type: none"> 1. A branch of public international law, and relevant juridical mechanisms at global as well as regional levels, 2. Human rights as an object of study in history, philosophy and the social sciences, as well as a practical reality in national and international politics. 3. Different forms of promoting and implementing human rights, domestically as well as on the international level. 4. The role of human rights in contemporary issues relating to terrorism, religion, ethnicity, gender and development. 5. Cholarly values such as transparency, impartiality, clarity, reliance and the importance of sound reasoning and empirical inference.
Course outcomes	<p>Student will be able to virtue:</p> <ol style="list-style-type: none"> 1. identify, contextualise and use information about the human rights situation in a given country 2. critically appraise source material, including cases from human rights committees and tribunals and reports and summary records from treaty bodies 3. analyse a country's situation or an international situation in terms of human rights and formulate human rights-based initiatives and policies 4. Promote human rights through legal as well as non-legal means. 5. Participate in legal, political and other debates involving human rights in a knowledgeable and constructive way

Unit no.	Topics	Hours allotted 60hrs
1	<i>Background:</i> Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights	08 hrs
2	<i>Human rights at various level :</i> Human Rights at Global Level UNO, Human Rights – UDHR 1948 – UN Conventions on Human Rights: International Covenant on civil and Political Rights 1966, International Convent on Economic, Social and Cultural Right, Racial Discrimination -1966 International, Instruments: U.N. Commission for Human Rights, European Convention on Human Rights.	15 hrs
3	<i>Human rights in India :</i> Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, Composition Powers and Functions, National Commission for Minorities, SC/ST and Woman	12 hrs
4	<i>Human Rights Violations:</i> Human Rights Violations against Women, Human Rights Violations against Children, 35 Human Rights Violations against Minorities SC/ST and Trans-genders, Preventive Measures.	13 hrs
5	<i>Political issues:</i> Political Economic and Health Issues, Poverty, Unemployment, Corruption and Human Rights, Terrorism and Human Rights, Environment and Human Rights, Health and Human Rights	12 hrs

Reference Books:

1. JagannathMohanty Teaching of Human sRights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi2009
2. Ram Ahuja: Violence Against Women Rawat Publications JewaharNager Jaipur.1998.
3. SivagamiParmasivam Human Rights Salem 2008
4. Hingorani R.C.: Human Rights in India: Oxford and IBA New Delhi.

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	MMRIT 112
Name of the Course	DISSERTATION / PROJECT WORK

1. Dissertation/Project work should be carried out as an individual Dissertation and actual bench work.
2. The students will carry independent project work under the supervision of the staff of Department on an advanced topic assigned to him/her. Inhouse projects are encouraged. Students may be allowed to carry out the project work in other Departmental laboratories /Research institutes /Industries as per the availability of Infrastructure.
3. Co guides from the other institutions may be allowed.
4. The Dissertation/Project work will begin from 3rd Semester, and will continue through the 4th Semester.
5. The Dissertation/Project report (also work book shall be presented at the time of presentation and viva voce) will be submitted at the end of the 4th Semester and evaluated.
6. Five copies of the project report shall be submitted to the Director, SBS.
7. For the conduct of the End Semester Examination and evaluation of Dissertation/Project work the University will appoint External Examiners.
8. Since the dissertation is by research, Dissertation/Project work carries a total of 250 marks and evaluation will be carried out by both internal and external evaluators.
9. The student has to defend his/her Dissertation/Project Work in a seminar which will be evaluated by a internal and external experts appointed by the University.
10. The assignment of marks for Project/Dissertation is as follows:

Part I-

Topic Selection, Review of Literature, Novelty of works-50 marks

Part-II-

 - a. Continuous Internal Assessment, Novelty, Overall Lab Work Culture - 100 Marks
 - b. Dissertation/Project work book: 50 Marks
 - c. Viva-Voce: 50 Marks
- d. However, a student in 4th semester will have to opt for general elective course from other related disciplines in addition to his Dissertation/Project work in the parent department.

MONITORING LEARNING PROGRESS

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Model Checklists are attached

The learning out comes to be assessed should include:

- i) **Journal Review Meeting (Journal Club):** The ability to do literature search, in depth study, presentation skills, and use of audio- visual aids are to be assessed. The assessment is made by faculty members and peers attending the meeting using a checklist (see Model Checklist – I)
- ii) **Seminars / Symposia:** The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio- visual aids are to be assessed using a checklist (see Model Checklist-II)
- iii) **Teaching skills:** Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any. This performance should be based on assessment by the faculty members of the department and from feedback from the undergraduate students (See Model checklist III,)
- iv) **Work diary / Log Book-** Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal, reviews, seminars, etc. Special mention may be made of the presentations by the candidate as well as details of experiments or laboratory procedures, if any conducted by the candidate.
- v) **Records:** Records, log books and marks obtained in tests will be maintained by the Head of the Department.

Checklist - I

Model Checklist for Evaluation of Journal Review Presentations

Name of the student: _____ Date: _____

Name of the Faculty/ Observer: _____

S No.	Items for observation during presentation		Below average	Average	Good	Very Good
		0	1	2	3	4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross- references have been consulted					
4	Whether other relevant references have been Consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-visuals aids used					
7	Ability to defend the paper					
8	Clarity of presentation					
9	Any other observation					
	Total score					

Checklist - II

Model Checklist for Evaluation of the Seminar Presentations

Name of the student: _____ Date: _____

Name of the Faculty/ Observer: _____

S No.	Items for observation during presentation		Below average	Average	Good	Very Good
		0	1	2	3	4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross- references have been consulted					
4	Whether other relevant references have been Consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-visuals aids used					
7	Ability to defend the paper					
8	Clarity of presentation					
9	Any other observation					
	Total score					

Checklist - III

Model Checklist for Evaluation of Teaching Skill

Name of the student: _____

Date: _____

Name of the Faculty/ Observer: _____

S. No.		Strong Point	Weak point
1	Communication of the purpose of the talk		
2	Evokes audience interest in the subject		
3	The introduction		
4	The sequence of ideas		
5	The use of practical examples and /or illustrations		
6	Speaking style (enjoyable, monotonous, etc., specify)		
7	Summary of the main points at the end		
8	Ask questions		
9	Answer questions asked by the audience		
10	Rapport of speaker with his audience		
11	Effectiveness of the talk		
12	Uses of AV aids appropriately		

Checklist - IV**Model Check list for Dissertation / Project Work Presentations**

Name of the student: _____ Date: _____

Name of the faculty/ Observer: _____

S No.	Points to be covered		Below average	Average	Good	Very Good
		0	1	2	3	4
1	Interest shown in selecting topic					
2	Appropriate review					
3	Discussion with guide and other faculty					
4	Quality of protocol					
5	Preparation of proforma					
	Total score					

Checklist - V**Continuous Evaluation of dissertation / project work by Guide/
Co-Guide**

Name of the student: _____ Date: _____

Name of the faculty/ Observer: _____

S No.	Points to be covered		Below average	Average	Good	Very Good
		0	1	2	3	4
1	Interest shown in selecting topic					
2	Appropriate review					
3	Discussion with guide and other faculty					
4	Quality of protocol					
5	Preparation of proforma					
	Total score					

Checklist – VI**Continuous Evaluation of Directed Clinical Education (Clinical Posting) by Faculty in charge**

Name of the student: _____ Date: _____

Semester: _____ Name of the faculty/Observer: _____

Core Competencies	Grade
Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.	Write a grade 1-4 in the boxes below
I. Clinical Teaching	
a. Demonstrate beginning competency in technical skills.	
II. Independent Work by Student guided by faculty	
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	
b. Identify relevant data for communication in pre and post conferences	
c. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	
d. Identify need for help when appropriate to situation. Delegates level specific skills to appropriate team member.	
III. Hands on practical work by students	
a. Navigate and document clear and concise responses to care in the electronic health record for patient, where appropriate for clinical setting	
b. Protect confidentiality of electronic health records data, information, and knowledge of technology in an ethical manner	
IV. Independent work by student	
a. Maintain a positive attitude and interact with inter-professional team members, faculty, and fellow students in a positive, professional manner. Accept constructive feedback and develop plan of action for improvement.	
b. Demonstrate expected behaviours and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behaviour and appearance.	
c. Accept individual responsibility and accountability for nursing interventions, outcomes, and other actions. Engage in self evaluation & assumes responsibility for learning.	

***Clinical evaluation tool guidelines for full descriptions of grades 1-4.**

4-exceeds expectations (range of marks –40-50 marks)

3-meets expectations (range of marks –30-40 marks)

2-below expectations (range of marks –25-30 marks)

1-does not meet expectations (range of marks –no marks)

Name of the Programme	M.Sc. Medical Radiology & Imaging Technology
Course Code	MMRIT 114
Name of the Course	EDUCATIONAL TOUR/FIELD WORK/IV/HOSPITAL VISIT

Resolution No. 4.4.1.3 of BOM-55/2018: Resolved to approve the revised syllabus of ‘Research Methodology and Biostatistics’ subject for all the PG courses (including 3 years) and to shift it in 2nd semester with effective from the batch admitted in the Academic Year 2018-19 onwards under MGM School of Biomedical Sciences. **[Annexure-13]**



Mansee Thakur <mansibiotech79@gmail.com>

Annexure-13

To compulsorily include in the BOS agenda

1 message

Registrar <registrar@mgmuhs.com>

6 September 2018 at 14:17

To: drravindrai@gmail.com, inamdar123456@gmail.com, ipseetamohanty@yahoo.co.in, jaishreeghanekar@gmail.com, drspravin22@gmail.com, dr_spravin@hotmail.com, sudhirkul1979@gmail.com, mansibiotech79@gmail.com, sbsnm@mgmuhs.com, rajani.kanade@gmail.com, mgmschoolofphysiotherapy@gmail.com, prabhadasila@gmail.com, mgmnewbombaycollegeofnursing@gmail.com, gashroff2006@gmail.com, rupalgshroff@yahoo.com, manjushreeb@yahoo.com, drshobhasalve@gmail.com, spdubhashi@gmail.com, javantkarbhase@gmail.com, veenashatolkar@gmail.com, sharathcrisp@gmail.com, mgmplth@themgmgroup.com, anuradhamhaske@hotmail.com, principalconabad@gmail.com
Cc: registrar@mgmuhs.com, mgmihsaurangabad@gmail.com, dr.rajeshkadam07@gmail.com, aradmin@mgmuhs.com

Dear Sir/Madam,

Please find attached herewith request from Dr. Rita Abbi, Professor, Biostatistics regarding Modification in the syllabus of 'Research Methodology and Biostatistics' subject and Proposal to make this subject compulsory in all the PG courses. You are requested go through this and include it in your agenda for forthcoming BOS in September, 2018.

Thanks and regards,

Dr. Rajesh B. Goel

Registrar

MGM Institute of Health Sciences, Navi Mumbai

(Deemed University u/s 3 of UGC act, 1956)

3rd Floor, MGM Educational Campus,

Plot No. 1 & 2, Sector -1, Kamothe,

Navi Mumbai - 410 209

Tel.: 022 - 27432471 / 27432994

Fax: 022 - 27431094

Email: registrar@mgmuhs.com

Website: www.mgmuhs.com



Modification in the syllabus of Research Methodology and Biosta.pdf
2261K

MGM SCHOOL OF BIOMEDICAL SCIENCES, NAVI MUMBAI

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed University u/s 3 of UGC Act 1956)

Grade "A" Accredited by NAAC

Sector 1, Kamothe Navi Mumbai-410209, Tel.No.:022-27437631,27432890

Email: sbsnm@mgmuhhs.com / Website : www.mgmbsnm.edu.in

To,

The Director
MGM School of Biomedical Sciences
Kamothe,
Navi Mumbai – 410 209

7-6-2018
25

Subject: Modification in the syllabus of 'Research Methodology and Biostatistics'
Subject and Proposal to make this subject compulsory in all the PG courses

Dear Madam,


Research Methodology and Biostatistics subject is a significant tool for academic research. It has been observed that majority of post graduate courses have this subject as a part of their course work. There is a need to modify the curriculum of 'Research Methodology and Biostatistics subject' due to the following reasons:

1. While going through the Research Methodology and Biostatistics syllabus it was found that in some courses more weightage was given to computer hardware e.g. History and development of computers(old pattern) which may not be needed now as we have witnessed the revolution in Information Technology. Students should be taught latest technology and software.
2. Secondly, in most of the syllabi 'Vital Statistic' is missing which is an important topic for healthcare field. Some of the essential topics like 'Normal distribution' etc are missing.
3. By streamlining the syllabus it will save teacher's teaching time, paper setting time. Moreover, Exam section need not call multiple examiners for the same subject, this will be economical for exam section.

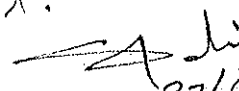
This subject is well recognized as an essential tool in medical research, clinical decision making, and health management. It is recommended to streamline the syllabus and make **Research Methodology and Biostatistics' compulsory in all the post graduate courses of School Biomedical Sciences.** The modified syllabus is enclosed.

This is for your kind perusal and necessary action please.

With regards,


Dr. Rita Abbi
Professor, Biostatistics

Copy for information to
Registrar MGMIHS Navi Mumbai;
✓ Hon'ble Vice Chancellor, MGMIHS Navi Mumbai
Hon'ble Medical Director, MGM Medical College

Seen.
BOS → Faculty → Academic
Council.

27/6

MGM Institute Of Health Sciences
INWARD NO. 5720
DATE: 25/6/18
REF: TC

27/6
preparing to break
All chairs persons to all hands
27/6

MGM INSTITUTE OF HEALTH SCIENCES

M. Sc. Students

Syllabus for Research Methodology and Biostatistics

		No. of Hours	
I. Research Methodology:		Theory	Practical
1	Scientific Methods of Research : Definition of Research, Assumptions, Operations and Aims of Scientific Research, Research Process, Significance and Criteria of Good Research , Research Methods versus Methodology, Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report	5	—
2	Research Designs: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case Control Studies, Cross sectional studies, Intervention studies, Panel Studies.	5	—
3	Sampling Designs : Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs (Probability sampling and non probability sampling), How to Select a Random Sample?, Systematic sampling, Stratified sampling, Cluster sampling, Area sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5	4
4	Measurement in research: Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Possible sources of error in measurement, Tests of sound measurement	5	5
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data	5	3
6	Sampling Fundamentals : Need and importance for Sampling, Central Limit Theorem, Sampling Theory, Concept of Standard Error, Estimation, Estimating the Population Mean Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level.	5	3
II. Biostatistics			
1	Data Presentation : Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter plots, line graphs	3	4
2	Measures of Central Tendency and Dispersion : Mean, Median, Mode Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3	4

3	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Normal distribution, data transformation Important Parametric Tests, Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Hypothesis Testing for Comparing a Variance to Some Hypothesized Population Variance, Testing the Equality of Variances of Two Normal Populations.	6	
4	Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi-square Test, Alternative Formula, Yates' Correction, and Coefficient by Contingency.	2	2
5	Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis	2	3
6	Analysis of Variance and Covariance: Analysis of Variance (ANOVA): Concept and technique of ANOVA, One-way ANOVA, Two-way ANOVA, ANOVA in Latin-Square Design Analysis of Co-variance (ANOCOVA), ANOCOVA Technique.	4	4
7	Nonparametric or Distribution-free Tests: Important Nonparametric or Distribution-free Test Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test Kruskal Walli's test, Friedman's test, and Spearman Correlation test.	3	4
8	Vital Health Statistics: Measurement of Population: rate, crude rate, specific rate, <i>Measurement of fertility</i> : specific fertility rate, Total fertility rate, <i>Reproduction rate</i> , Gross Reproduction Rate, Net Reproduction Rate, Measures related to mortality: Crude Death Rate (CDR), Age-specific death Rate, Infant and child mortality rate, Measures related to morbidity.	4	6
9	Computer Application Use of Computer in data analysis and research, Use of Software and Statistical package. Introduction to SPSS. Importing data from excel, access, tab and comma separated files. Entering data, labeling a variable, coding and recoding a categorical and continuous variable. Converting data from string to numeric variables, sorting & filtering, merging, appending data sets. Frequencies, descriptive statistics, cross tabulations. Diagrammatic presentation include histogram, bar chart, pie chart, scatter diagram, box plot, line chart. Parametric test of hypothesis-one sample, Independent and paired sample t test, one way ANOVA & post HOC test. Testing for normality, Chi-square test with measures of association. Pearson correlation. Non parametric test	3	6
Total hours		60	60

Resolution No. 4.13 of BOM-55/2018: Resolved as follows:-

- (i) Slow learners must be re-designated as potential learners.
- (ii) Students scoring less than 35% marks in a particular subjects/course in the 1st formative exam are to be listed as potential learners. These learners must be constantly encouraged to perform better with the help of various remedial measures.
- (iii) Students scoring more than 75% marks in a particular subjects/course in the 1st formative exam are to be listed as advanced learners. These learners must be constantly encouraged to participate in various scholarly activities.

Resolution No. 3.1.4.2 of BOM-57/2019:

- i. Resolved to include “Gender Sensitization” into UG (from new batch 2019-2020) and PG (from existing batches) curricula. [**Annexure-21**]
- ii. Resolved to align the module of “Gender Sensitization” with MCI CBME pattern for MBBS students.
- iii. Resolved that Dr. Swati Shiradkar, Prof., Dept. of OBGY., MGM Medical College, Aurangabad will coordinate this activity at both campuses.

Annexure - 21

Gender sensitization for UG (2nd , 3rd , 8th semesters) and PG (3 hours)

INCLUSION OF “ GENDER SENSATIZATION” IN CURRICULUM

Introduction :

The health care provider should have a healthy gender attitude, so that discrimination, stigmatization, bias while providing health care will be avoided. The health care provider should also be aware of certain medico legal issues related with sex & gender.

Society particularly youth & adolescents need medically accurate, culturally & agewise appropriate knowledge about sex, gender & sexuality. So we can train the trainers for the same. It is need of the hour to prevent sexual harassment & abuse .

To fulfill these objectives, some suggestions are there for approval of BOS.

Outline

1)For undergraduates :- Three sessions of two hours each, one in 2nd term, one in 3rd term & one in 8th term.

2)For Faculties and postgraduates :- One session of two hrs .

3)For those want to be trainers or interested for their ownself, value added course, which is optional about sex, gender, sexuality & related issues.

Responsibility

ICC of MGM, MCHA , with necessary support from IQAC & respective departments.

Details of undergraduate sessions

1)First session in 2nd term

Aim – To make Students aware about the concept of sexuality & gender.

To check accuracy of knowledge they have,

To make them comfortable with their own gender identify & related issues.

To make them aware about ICC & it is functioning.

Mode – Brain storming , Interactive power point presentation experience sharing.

Duration – Around two hours

Evaluation – Feedback from participants.

2)Second session in 3rd / 4th term

Aim – To ensure healthy gender attitude in these students as now they start interacting with patients.

To ensure that the maintain dignity privacy while interacting with patients and relatives, particularly gender related.

To make them aware about importance of confidentiality related with gender issues.

To encourage them to note gender related issues affecting health care & seek solutions.

Mode – focused group discussions on case studies, Role plays & discussion.

--3--

Duration – Around two hours.

Evaluation – Feedback from participants.

Third session in 8th term.

Aim – To understand effect of gender attitudes on health care in various subjects.

To develop healthy gender attitude while dealing with these issues.

Mode – Suggested PBL by departments individually. (In collaboration with ICC till faculty sensitization is complete)

Evaluation – Feedback

FOR POSTGRADUATES

Session of 2-3 hrs preferably in induction program.

Aim – To introduce medically accurate concept of gender, sex, gender role & sex role.

To ensure healthy gender attitude at workplace.

To understand gender associated concepts on health related issues & avoid such bias while providing health care.

To make them aware about ICC & its functioning.

Mode – Interactive PPT

Role plays & discussion

Duration – 2 to 3 hrs

Evaluation – Feedback.

FOR FACULTIES

Session of 2 hours may be during combined activities.

Aim – To ensure clarity of concept about gender & sex.

To discuss effect of these concepts on health related issues.

To identify such gender & sex related issues in individual subject specialties.

To discuss methodology like PBL for undergraduate students when they are in 7th-8th semester.

Mode – Role play

Focused group discussion

Case studies

Evaluation – Feedback.

Sdp-Pimple/joshi-obgy

Resolution No. 3.2.1.6.a of BOM-57/2019: Resolved to allot 50 marks for Internal Assessment in Industrial Visit for all the batches under CBCS pattern - M.Sc. (2 year) & MHA program.

Resolution No. 3.2.1.6.d of BOM-57/2019: Resolved that in “Rules & Regulation of Exam for PG Student (CBCS)” to keep “10 marks for Viva instead of 5 marks and no marks for journal” in the final university exam for PG students (M.Sc. 02 years CBCS pattern) admitted from Academic Year 2019-20 onwards.

Resolution No. 4.3.1.2 of BOM-63/2021: Resolved to include topics related to COVID 19 in UG {B.Sc. AT & OT (BOTAT 108L), B.Sc. MLT(BMLT 108 L), B.Sc. MRIT (BMRIT 108L), B.Sc. MDT-(BMDT 108L), B.Sc. CCT (BCCT 108L), B.Sc.PT (BPT 108L), B.Optomety (BOPTOM 108L) Programs for Batch AY 2020-21 (Semester II)} & B.Sc. Medical Laboratory Technology SEMESTER-VI in subject of Medical Microbiology-II (BMLT 125 L) & Medical Microbiology-II (BMLT 125 P) for Batch AY 2020-21. **[Annexure-7]**
Further Dr. N.N. Kadam, Hon'ble Pro Vice Chancellor suggested to add topics under "Newer Infectious Diseases" as the main topic.

Annexure-07 of BOM-63/2021 dt 17.02.2021

To include Covid-19 topics in health professional curriculum as per the BOM Resolution No. 3.7 of BOM-62/2020

- a) M.Sc. (PG Program), (M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Biostatistics, M.Sc. Molecular Biology, M.Sc. MRIT, M.Sc. CCT, M.Sc. Clinical Nutrition, M.Sc. Clinical Embryology, Master in Hospital Administration, Master of Public Health, and M.Optomety)

Approved syllabus	Name of the subject	Existing content	Proposed changes
Common Syllabus for Semester IV – 2 year M.Sc. programs (M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Biostatistics, M.Sc. Molecular Biology, M.Sc. MRIT, M.Sc. CCT, M.Sc. Clinical Nutrition, M.Sc. Clinical Embryology, Master in Hospital Administration, Master of Public Health, and M.Optomety)	BIOETHICS, BIOSAFETY, IPR & TECHNOLOGY TRANSFER GE 002 L	Sr. no. 2 Introduction to quality assurance, accreditation & SOP writing :Concept of ISO standards and certification , National regulatory body for accreditation, Quality parameters, GMP & GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clinical and testing laboratory	Sr. no. 2 Introduction to quality assurance, accreditation & SOP writing :Concept of ISO standards and certification , National regulatory body for accreditation, Quality parameters, GMP & GLP, Standard operating procedures, Application of QA in field of genetics, Data management of clinical and testing laboratory, WHO & CDC, ICMR guidelines for Biosafety and Vaccines with regards COVID 19

Resolution No. 4.3.1.3 of BOM-63/2021: Accorded post facto approval for changes in the index of UG (B.Sc. AT & OT, B.Sc. MLT, B.Sc. MRIT, B.Sc. MDT, B.Sc. CCT, B.Sc.PT, B. Optometry) and PG 2 year (M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Biostatistics, M.Sc. Molecular Biology, M.Sc. MRIT, M.Sc. CCT, M.Sc. Clinical Nutrition, M.Sc. Clinical Embryology, Master in Hospital Administration, Master of Public Health, and M.Optomtery). **[Annexure-8A, 8B]**

OUTLINE OF COURSE CURRICULUM														
M.Sc. Medical Radiology and Imaging Technology														
Semester I														
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory														
MMRIT 101 L	Conventional Radiology and Imaging Equipments	4	-	-	-	4	60	-	-	-	60	20	80 (UEX)	100
MMRIT 102 L	Modern Radiological and Imaging Equipment	4	-	-	-	4	60	-	-	-	60	20	80 (UEX)	100
MMRIT 103 L	Radiation Safety and Protection	3	-	-	-	3	45	-	-	-	45	20	80 (UEX)	100
MMRIT 104 CP	MRIT Directed Clinical Education - I	-	-	-	27	9	-	-	-	405	405	-	50 (INT)	50
Practical														
MMRIT 101 P	Conventional Radiology and Imaging Equipments	-	-	4	-	2	-	-	60	-	60	10	40 (UEX)	50
MMRIT 102 P	Modern Radiological and Imaging Equipment	-	-	4	-	2	-	-	60	-	60	10	40 (UEX)	50
Total		11	0	8	27	24	165	0	120	405	690	80	370	450

OUTLINE OF COURSE CURRICULUM														
M.Sc. Medical Radiology and Imaging Technology														
Semester II														
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory														
MMRIT 105 L	Radiographic and Imaging Techniques	3	-	-	-	3	45	-	-	-	45	20	80 (UEX)	100
MMRIT 106 L	Interventional Radiological Techniques	4	-	-	-	4	60	-	-	-	60	20	80 (UEX)	100
MMRIT 107 L	Radiological Physics for Imaging	3	-	-	-	3	45	-	-	-	45	20	80 (UEX)	100
MMRIT 108 CP	MRIT Directed Clinical Education - II	-	-	-	27	9	-	-	-	405	405	-	50 (INT)	50
CC 001 L	Research Methodology & Biostatistics (Core Course)	4	-	-	-	4	60	-	-	-	60	20	80 (UEX)	100
Practical														
MMRIT 105 P	Radiographic and Imaging Techniques	-	-	4	-	2	-	-	60	-	60	10	40 (UEX)	50
MMRIT 107 P	Radiological Physics for Imaging	-	-	4	-	2	-	-	60	-	60	10	40 (UEX)	50
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	10	40 (UEX)	50
Core Elective Course														
CEC 001 L	Basics of Clinical Skill Learning	3	-	-	-	3	45	-	-	-	45	-	100 (INT)	100
CEC 002 L	Hospital Operation Management													
Total		17	0	12	27	32	255	0	180	405	840	110	590	700

OUTLINE OF COURSE CURRICULUM															
M.Sc Medical Radiology and Imaging Technology															
Semester III															
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks			
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	University Semester Exam (UEX)/ Internal Semester Exam (INT)	Total	
Theory															
MMRIT 109 L	Radiological and Imaging Procedures	4	-	-	-	4	60	-	-	-	60	20	80 (UEX)	100	
MMRIT 110 L	Quality Assurance in Diagnostic Imaging	4	-	-	-	4	60	-	-	-	60	20	80 (UEX)	100	
MMRIT 111 CP	MRIT Directed Clinical Education - III	-	-	-	21	7	-	-	-	405	405	-	50 (INT)	50	
MMRIT 112	Dissertation / Project*	10	-	-	-	5	-	-	-	-	-	-	50 (INT)	50	
Practical															
MMRIT 110 P	Quality Assurance in Diagnostic Imaging	-	-	4	-	2	-	-	120	-	120	10	40 (UEX)	50	
Seminar															
MMRIT 113	Seminars	-	-	-	-	1	-	-	-	-	-	-	50 (INT)	50	
Total		18	0	4	21	23	120	0	120	405	645	50	350	400	

OUTLINE OF COURSE CURRICULUM															
M.Sc Medical Radiology and Imaging Technology															
Semester IV															
Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks			
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total	
Theory (General Elective**)															
GE 001 L	Pursuit of Inner self Excellence (POISE)	4	-	-	-	4	60	-	-	-	60	-	100 (INT)	100	
GE 002 L	Bioethics, Biosafety, IPR and Technology Transfer														
GE 003 L	Disaster Management and Mitigation Resources														
GE 004 L	Human Rights														
Practical															
MCCT 112	Dissertation / Project	-	-	36	-	18	-	-	-	-	-	-	200 (UEX)	200	
MCCT 114	Educational Tour / Field Work/TV/Hospital Visit	-	-	-	-	2	-	-	-	-	-	-	50 (INT)	50	
Total		4	0	36	0	24	60	0	0	0	60	0	350	350	

<p>12.1 : Minutes of CBCS meeting held on 3.02.2021</p> <p>I. Courses titled as elective, seminar, clinical posting etc. will be evaluated at university level, only:</p>	<p>Decision taken by CBCS Committee:</p> <p>Members agreed that all courses (core, elective, seminar, clinical posting etc) in all programs with CBCS curriculum under MGM School of Biomedical Sciences (MGMSBS-UG & PG), MSc Medical Programme under MGM Medical College and MGM School of Physiotherapy (MGMSOP) (BPT & MPT) will be evaluated at the level of the University at the end during semester examination. (Detailed included as 1, 2,3,4 points)</p>
<p>1. Courses which were evaluated at constituent units titled as elective, seminar, clinical posting etc. will be evaluated at university level for UG & PG of MGMSBS, Navi Mumbai:</p>	<p>MGM School of Biomedical Sciences (MGMSBS-UG) :First year B.Sc. (Semester I & Semester II) (core-1.1 & 1.2) and (elective-1.3) common for all seven programs (B.Sc. DT, B.Sc. AT & OT, B.Sc. CCT, B.Optomtry, B.Sc. PT, B.Sc. MRIT, B.Sc. MLT) which were having 100 marks previously will be changed to 50 marks (40 marks university Semester End Exam-(SEE) and 10 marks Internal Assessment – (IA) as per below format - 1.4) w.e.f AY 20-21. (Annexure 1)</p> <p>Clinical Directed posting allotted 50 marks will be assessed as university end semester exam w.e.f AY 20-21. (Annexure 1.1)</p> <p>(request to add</p> <p style="padding-left: 40px;">a) evaluation pattern of seminar - 50 marks– BSc Dialysis- sem IV</p> <p style="padding-left: 40px;">b) Boptometrysem III – course : geometrical optics and visual optics I/II</p> <p style="padding-left: 40px;">sem IV – optometric instrumentation</p> <p>10 IA + 40 SEE – format submitted)</p>
	<p>2.1 Courses which were evaluated at constituent units titled as elective, seminar, clinical posting etc. will be evaluated at university level.</p> <p>Members agreed that all courses (core, elective, seminar, clinical posting etc) in all programs with CBCS curriculum under MGM School of Biomedical Sciences (MGMSBS- PG), will be evaluated at the level of the University end semester examination w.e.f. AY 2020-21.</p> <p>* For PG program (M.Sc. 2 year including allied program, MHA, MPH) having courses like seminar/education tour & Industrial visit which were allotted 50 marks will be assessed as university end semester exam.</p> <p>a. Amended 10 marks in seminar (Annexure-2.1A)</p> <p>b. Amended 20 marks for Educational Tour/Field Work/Hospital Visit/ Industrial Visit (Annexure-2.1B)</p> <p>c. 50 marks for Clinical Directed Posting (no change) (Annexure-2.1C)</p> <p>(request to add the evaluation pattern for MPH – sem I,II, III)</p> <p>MOptomtry – Sem I – evaluation pattern to be added)</p> <p>2.2 PG Courses which were evaluated at constituent units titled as elective carrying 100 marks as only similar to that of core courses, will be evaluated at university level. Similar pattern which is being followed for core Subjects (IA - 20 Marks + university exam - 80 marks) will be followed.(Annexure-2.2)</p>

Resolution No. 10.4 of Academic Council (AC-42/2022):

- i) “Resolved to accept “50% eligibility in internal assessment” pattern for all the CBCS programs (UG & PG) running under the constituent units of MGMIHS.(MGM School of Biomedical Sciences, MGM School of Physiotherapy, MGM Medical College (M.Sc. Medical 3 year courses).

This will be applicable to all existing batches (for remaining regular examinations) and forthcoming batches from June 2022 onwards”

Resolution No.6.7 of Academic Council (AC-48/2023): Resolved to approve the list of books from M.Sc. Clinical Embryology, M.Sc. Medical Biotechnology, M.Sc. Clinical Nutrition, B. Optometry, B.Sc. MRIT, M.Sc. MRIT & M. Optometry [Annexure-50].

Programme Name	Book Name	Author
B.Sc. & M.Sc. Medical Radiology and Imaging Technology	Christensen's Physics of Diagnostic Radiology	1.Thomas S. Curry 2. James E. Dowdey 3. Robert C. Mrurry JR
	Textbook of Radiographyc and related anatomy	1.John P. Lamnpigno 2. Leslie E. Kendrick
	Computed Tomography Physcal Principle, Clinical Application and Quality Control	1.Euclid Seeram
	Chesney's Radiogrpahic Imaging	1.John ball and Tony Price
	Textbook of Radiological Safety	1. K. Thayalan
	Radiation Protection in Medical Radiography	1. Mary Alice Statkiewicz Sherer 2. E Russell Riteenour 3.Keli Welch Haynes
	MRI in Practice	1.Catherine Westbrook 2. Carolyn Kaut Roth 3. John Talbol
	Chapman & Nakielney's Guide to Radiological Procedures	1.Nick Watson 2. Hefin Jones
	Equipments for Diagnostic Radiography	E. Forsters



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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