



**M S RAMAIAH
UNIVERSITY OF APPLIED SCIENCES**

Programme Specifications

Revised (in 2019)

**B.Sc. (Hons) –Medical Radiology and
Imaging Technology**

Batch 2018

Faculty of Life and Allied Health Sciences

**Ramaiah University of Applied Sciences, University House,
New BEL Road, MSR Nagar, Bengaluru – 560 054**

www.msruas.ac.in

Programme Specifications: B.Sc. (Hons)- Medical Radiology and Imaging Technology	
Faculty	Faculty of Life and Allied Health Sciences
Department	Allied Health Sciences
Programme	B.Sc. (Hons)-Medical Radiology and Imaging Technology
Head of the Department	Dr Medha Joshi
Dean of Faculty	Dr. Sundaresh DC

- 1. Title of the Award**
B.Sc. (Hons) - Medical Radiology and Imaging Technology
- 2. Modes of study**
Full-Time
- 3. Awarding Institution / Body**
M.S.Ramaiah University of Applied Sciences – Bengaluru, India
- 4. Joint Award**
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- 5. Teaching Institution**
Department of Allied Health Sciences, RUAS
- 6. Date of Programme Specifications review**
April 2018
- 7. Date of Programme Approval by the Academic Council of MSRUAS**
May 2018
- 8. Next Review Date**
April 2022
- 9. Programme Approving Regulatory Body and Date of Approval**
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- 10. Programme Accrediting Body and Date of Accreditation**
- 11. Grade Awarded by the Accreditation Body**
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- 12. Programme Accreditation Validity**
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- 13. Programme Benchmark**
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14. Rationale for the Programme

Advances in science and technology have made a paradigm shift in health care over the past decade resulting in wider appreciation of the fact that health service delivery should go beyond just physicians and nurses and involve team work among clinicians and non-clinicians or allied health professionals. India is fast emerging on a global medical tourism hub with international patient base growing in double digits every year. This rising trend has resulted in an increase in investment by health care providers by installing best in class equipment upgrading medical technology and quality accreditation. In the current scenario physicians dependent on sophisticated machinery and technology, to arrive at an appropriate diagnosis. Allied healthcare professional (AHP) who can handle this equipment form an indispensable member of the team for successful management of patients.

Medical Radiology and imaging technology deals with radiation to diagnose and treat diseases. Many specialities are entirely dependent on radiology technologists to produce highly accurate images for precise detection of injuries, diseases and monitor treatment and progression or relapse of many diseases in a minimally invasive and anatomically precise manner. Medical Imaging technology has advanced in the last twenty years and includes now both invasive and non-invasive procedures which are highly specialised and sophisticated techniques requiring handling of advanced equipment by well-trained technologists. Thus a trained medical radiology and imaging technologist becomes an essential member in both diagnostic and interventional radiology team.

A thorough knowledge of radiation protection and safety, structure and function of the body, effects of injury and diseases on the body are essential for a successful radiographic technologists. A wide range of imaging technologies which are being currently used such as CT, MRI, DEXA, ultra-sound, angiography, and mammography require skilled professionals to handle the advanced imaging equipments. They are also expected to have good communication, patient care and monitoring skills

This innovative competency based curriculum is adopted from the guidelines published by Ministry of Health and Family Welfare, allied health Section 2015- 2016.

A competency-based program focuses on blend of skills and knowledge based on the needs of the community. The main competencies that have been identified as essential in an allied health care professional are clinical knowledge, patient care and communication approaches, which is then developed by teaching relevant content across a range of courses and settings.

The curriculum is outcome based and it focuses on required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, analytical thinking and problem solving abilities for a smooth transition from academic to real-life work environment. Students do one year internship in the hospitals for skill development to work in a team to enhance practical skills and problem solving abilities. The students are required to submit a well written project report in partial fulfilment for the award of the degree, which will help develop skills of documenting scientific work. In addition students are trained in communication skills and interdisciplinary topics to enhance their scope. The various new features such as foundation courses, early clinical exposure, inclusion of bioengineering courses, major specialization, open electives and one year of internship make the students more versatile generating wide range of opportunities including registering for Masters in medical radiology and imaging technology. Advanced teaching and learning resources, and experience of the faculty members with their strong connections with health care industry and research organizations makes this programme unique.

For global mobility and acceptability of the graduates, the current curriculum structure is divided into smaller sections with focus on hours of studying that are converted into credit hours as per the international norms followed by various countries

Integrated structure of the curriculum

This competency based curriculum follows horizontal and vertical integration between disciplines; and bridges the gaps between both theory and practice, and between hospital-based practice and community practice.

15. Programme Mission

The purpose of the programme is creation of knowledgeable human resources to work in government, semi-government, private and public sector owned hospitals and health care organizations and also to assume administrative positions. With further progression in education, graduates should be able to undertake teaching and research in colleges and universities as well as in scientific organizations.

16. Graduate Attributes

The courses have been designed with a focus on performance-based outcomes pertaining to medical radiology and imaging technology. The learning goals and objectives of the undergraduate education program is based on the performance expectations. They are articulated as learning goals (why we teach this) and learning objectives (what the students will learn). Using the framework, students will learn to integrate their knowledge, skills and abilities in a hands-on manner in a professional healthcare setting. The learning goals are divided into nine key areas,

1. Clinical care
2. Communication
3. Member of a multidisciplinary health care team
4. Ethics and accountability at all levels (clinical, professional, personal and social)
5. Commitment to professional excellence
6. Leadership and mentorship
7. Social accountability and responsibility
8. Scientific attitude
9. Lifelong learning

17. Programme Goal

The programme acts as a specialized course and helps to develop critical, analytical and problem solving skills at first level. This foundation degree makes the graduates employable in health care organizations and also to assume administrative positions in various types of organizations. The students can progress to pursue a career in academics or health care industry or as a researcher.

18. Programme Objectives

The Bachelor of Science Honors degree programme in Medical Radiology and Imaging Technology imparts knowledge and understanding of structure and function of human body. The programme provides sufficient understanding and cognitive abilities to operate, develop and incorporate quality scientific methods, techniques, and processes applicable to various health care delivery systems to achieve the desired results. In addition, the programme imparts knowledge and training to develop transferable skills and ability to work in communities.

Medical Radiology and Imaging Technology (Semester 4 to 8)**The objectives of the program are to:**

1. Provide well trained competent qualified technologist who are able to work in hospitals , private clinic and centers in emergency and routine situations
2. Demonstrate problem solving critical thinking and communication skills in the technologist in varied clinical areas.
3. Produce professionals who are ethical in behavior and practice while fulfilling the responsibilities of patient care
4. Train graduate students with specific skills necessary for entry level either in academic sphere or clinical practice.

Graduate attributes

1. Should be able to undertake mammography, CT scan and MRI procedures independently. And assist in specialized radiological procedures.
2. Able to do handle all radiological and imaging equipment independently and do the image processing.
3. Should comply with radiation protection and safety measures and participate in quality assurance procedures.
4. Maintain all radiological and imaging equipment including identifying and managing emergency situations.
5. Able to communicate through verbal, written and electronic media
6. Should have compassionate caring and accountable attitude towards patients and peers.
7. Should be able to take leadership roles in the department and demonstrate ability to work as a successful member of a multidisciplinary team.

19. Intended Learning Outcomes of the Programme

The Intended Learning Outcomes (ILOs) are listed under four headings:

1. Knowledge and Understanding,
2. Cognitive Skills
3. Practical Skills
4. Capability / Transferable Skills

Core course: Foundation course- (Semester one to three)**Knowledge and Understanding**

- KU1: Explains health care delivery system in India, basic medical terminology, computer and IT, physics, mathematics and environmental science.
- KU2: Describes human rights, medical law and ethics and Indian constitution, sociology and ethics.
- KU3: Explains principles of management and practice management
- KU4: Collates and analysis medical records

Cognitive Skills

- CS1: Describes structure, function and biochemical reactions of human body
- CS2: Correlates diseases and specific health care technology
- CS3: Explains abnormal functioning and structure, various infections and effects of drugs on human body
- CS4: Selects and defends appropriate research methodology and biostatistics technique for a given research problem

Practical Skills

- PS1: Demonstrates basic and emergency care and life support skills
- PS2: Demonstrate the ability to provide a safe and effective care to the patient
- PS3: Analyses data on medical record using appropriate software
- PS4: Applies statistical software for data mining and analysis of the research project related data.

Transferable Skills

- TS1: Communicate effectively with the team members
- TS2: Manages clinical practice of the specialty technology within available resources
- TS3: Works under various situations such as community based or hospital based practice
- TS4: Adopts various quality assurance and patient safety measures

Medical Radiology and Imaging Technologist**1. Knowledge and Understanding**

- KU1: Explains the basic and applied anatomy, physiology and pathology as related to medical radiology
- KU2: Describes the correlation between radiology and physics and physics of newer imaging techniques
- KU3: Explains basis of conventional and modern radiography techniques
- KU4: Compares the special radiographic procedures

2. Cognitive Skills

- CS1: Identifies the requirement of imaging in emergency situations
- CS2: Evaluates images for technical quality
- CS3: Receives and documents verbal, written and electronic orders in the patient's medical record
- CS4: Interprets, applies and disseminates information as a member of the medical imaging team

3. Practical Skills

- PS1: Handles all radiological and imaging equipment independently
- PS2: Performs the image processing
- PS3: Assists in specialized radiological procedures.
- PS4: Undertakes Mammography, CT scan and MRI procedures independently

4. Capability / Transferable Skills

- TS1: Implements health and safety procedures as related to radiology
- TS2: Ensures the adherence to radiation protection legislation
- TS3: Demonstrates knowledge and skills to carry out the daily/weekly Quality control (QC) checks
- TS4: Undertakes care and maintenance of all radiological and imaging equipment

20. Programme Structure for B.Sc. (Hons) Medical Radiology and Imaging Technology (MRIT)

Basic Foundation Courses (Semester 1 to Semester 3) for all Streams (MRIT, DTT and OTT): 74 credits

SEMESTER 1

S. No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18AHG101A	Healthcare Delivery System India	3	0	3	100
2	18AHG102A	Computer Applications	1	2	2	50
3	18AHG103A	Communication Skills	3	0	3	100
4	18AHG104A	Medical Terminology and Record Keeping	1	2	2	50
5	18AHG105A	Constitution of India, Medical Law and Ethics	2	0	2	50
6	18AHG106A	Quality Assurance and Patient safety	2	2	3	150
7	18AHG107A	Health care professionalism and Values	2	0	2	50
8	18AHG108A	Principles of Management	2	0	2	50
9	18AHG109A	Community Orientation and Clinical Visit	1	2	2	50
10	18AHG110A	Medical sociology	2	0	2	50
Total			19	8	23	700
Total number of contact hours per week			27 hours			

SEMESTER 2

S. No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18AHG111A	General Anatomy	3	2	4	150
2	18AHG112A	General Physiology	3	2	4	150
3	18AHG113A	General Biochemistry	3	2	4	150
4	18AHG114A	General Microbiology	3	2	4	150
5	18AHG115A	Applied Physics	3	2	4	150
6	18AHG116A	Basic Electrical and Electronics	3	2	4	150
Total			18	12	24	900
Total number of contact hours per week			30 hours			

(Revised Credits from Semester 3 to 8 as approved in the Academic Council meeting held on 24th July'2019)

SEMESTER 3

S.No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18AHG201A	General Pathology	2	2	3	100
2	18AHG202A	Pharmacology	2	2	3	100
3	18AHG203A	Clinical Medicine	3	0	3	100
4	18AHG204A	Communication Skills for Health Care Professionals	2	0	2	50
5	18AHG205A	Research Methodology and Biostatistics	2	0	2	50
6	18AHG206A	Basic Medical Instrumentation	3	0	3	100
7	18AHG207A	Environmental Science and Health	2	0	2	50
7	18AHG208A	Early Clinical Exposure	0	6	3	50
Total			16	10	21	600
Total number of contact hours per week			26 hours			

SEMESTER 4

S.No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18MRT211A	Radiological Physics	3	4	5	150
2	18MRT212A	Conventional and Modern Radiological Equipment	3	4	5	150
3	18MRT213A	Radiography and Image post Processing Techniques including Advanced Imaging Technology	2	4	4	150
4	18MRT214A	Applied Anatomy, Physiology and Pathology	3	4	5	150
5	18BMRT215A	Directed Clinical Education - I		6	3	50
Total			11	22	22	650
Total number of contact hours per week			33 hours			

SEMESTER 5

S.No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18MRT301A	Clinical Radiography- Positioning	3 (Tut)	4	5	150
2	18MRT302A	Contrast and Special Radiographic Procedures	3	6	6	200
3	18MRT303A	Newer imaging techniques	1	4	3	100
4	18MRT304A	Directed Clinical Education - II		10	5	100
6	18OEE31xA	Open Elective- I			2	50
Total			7	26	21	600
Total number of contact hours per week			33 hours			

SEMESTER 6

S. No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18MRT311A	Patient Care in medical Imaging department	1	4	3	100
2	18MRT312A	Quality assurance in Radiology and Radiation safety	2	4	4	150
3	18MRT313A	Regulatory requirements in diagnostic radiology	2	0	2	50
4	18BMRT314A	Directed clinical education- III		20	10	100
5	18OEE32xA	Open Elective- II			2	50
Total			5	28	21	450
Total number of contact hours per week			33 hours			

SEMESTER 7 and SEMESTER 8

S. No.	Code	Course Title	Theory (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	18MRT401A	Research Project		8	4	100
2	18MRT402A	MRIT Internship		88	44	300
Total				96	48	400
Total number of contact hours per week						

Total program credits 132+48=180

Students have to undertake the rotational postings during which students have to work under supervision of an experienced staff in the following areas:

S.No.	Postings	Duration in weeks
1	Conventional radiography CR, DR	12
2	Radiographic special procedures including diagnostic and Therapeutic Interventional Procedures	10
3	Tele radiography	2
4	Nuclear Medicine	2
5	Ultrasonography and Doppler imaging	4
6	Mammography	2
7	Computed Tomography	6
8	Magnetic Resonance Imaging	6
	Total	44

Open Elective Courses: A number of open elective courses from Faculty of Mathematical and Physical Sciences, Engineering, Management and Commerce, Art and Design, Hospitality Management and Catering Technology, Pharmacy, Dental Sciences will be announced one semester prior to the scheduled semester. The students can also register through online mode as per the regulations

Teaching and Learning Methods

With a focus on self-directed learning, the curriculum will include a foundation course that focuses on communication, basic computer skills, professionalism, ethics and law. It also incorporate early clinical exposure and directed clinical education during specialty training. It is envisaged that the AHPs should have sufficient clinical exposure integrated with the learning of basic and laboratory sciences. There is an emphasis on the introduction of case scenarios for classroom discussion.

It is well documented in the literature that teaching and learning of clinical skills occur at the patient's bedside or other clinical areas supplemented by didactic teaching in classrooms and lecture theatres. Our institute has clinical skill center, laboratories and high-fidelity simulation laboratories to enhance the practice and training for allied and healthcare students and professionals. The skills training center overcomes the shortcoming of patients being used to learn and practice the necessary skills. The use of simulators addresses many issues such as lack of confidence and inadequate skills in handling the equipment. Practice on simulators and with corrective measures students can hone the skills and gain confidence to perform in real life situations.

The module delivery comprises of a combination of few or all of the following:

1. Face to face lectures using audio-visuals
2. Workshops-group discussions, debates, presentations
3. Demonstrations
4. Guest lectures
5. Laboratory-work/Field work/Workshop
6. Seminars
7. Group Exercises
8. Project Work
9. Hospital postings

Teaching modality	Learning opportunity examples
Patients	Teach and assess in selected clinical scenarios
	Practice soft skills
	Practice physical examination
	Receive feedback on performance
Mannequins	Perform acquired techniques
	Practice basic procedural skills
	Apply basic science understanding to clinical problem solving
Simulators	Practice teamwork and leadership
	Perform cardiac and pulmonary care skills
	Apply basic science understanding to clinical problem solving
Task under trainers	Monitor and terminate dialysis treatment, etc.

23. Assessment and Grading

1. Every course will be assessed for 200/150/ 100/50 Marks
2. The weightage of marks for components are as follows:
 - i) Course without Laboratory
Theory (Core Course) :100 marks (60% for CE and 40% for SEE)
Theory (Non-core Course) : 50 marks (30 for CE and 20 for SEE)
 - ii) Course with Laboratory
Theory : 70% Marks (50% for CE and 20% for SEE)
Lab : 30% Marks (20% CE and 10% for SEE)
 - iii) Laboratory/ Clinical (only) : 50/100 Marks (CE)
3. A minimum of overall 40% is required for a pass in the courses and attendance in SEE component is compulsory
4. The total marks for each course is given in the programme structure - section 20
5. Other flexibilities (exceptions) as per the programme regulations

**** Clinical examination includes**

1. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OSPE), Objective Structured Long Examination Record (OSLER)
2. Mini Case Evaluation Exercise (Mini-CEX)
3. Case-based discussion (CBD)
4. Direct observation of procedures (DOPs)
5. Portfolio
6. Multi-source feedback
7. Patient satisfaction questionnaire

24. Attendance

A minimum of 85% attendance is compulsory to appear for semester end examinations. Marks will be awarded to the student with more than 75% attendance as a part of Continuous Evaluation.

The marks will be awarded as follows:

- 75-80% =2 marks
- 81-85%= 4 marks
- 86-90%= 6 marks
- 91-95%= 8 marks
- 96-100%= 10 marks
- < 75%= 0

25. Award of Class

As per the Academic Regulations for B.Sc. (Hons) MRIT Programme

26. Student Support for Learning

Students are given the following support:

1. Course notes
2. Reference books in the library
3. Magazines and Journals
4. Internet facility
5. Computing facility
6. Laboratory facility
7. Workshop facility
8. Staff support
9. Lounges for discussions
10. Any other support that enhances their learning

27. Quality Control Measures

Following are the Quality Control Measures:

1. Review of question papers and assignment questions
2. Student Feedback
3. Opportunities for the students to see their assessed work
4. Staff Student Consultative Committee meetings
5. Student exit feedback
6. Subject Assessment Board (SAB)
7. Programme Assessment Board (PAB)

28. Curriculum Map

Course Code	Intended Learning Outcomes											
	Knowledge and Understanding				Cognitive (Thinking) Skills (Critical, Analytical, Problem-solving)				Practical skills			
	KU1	KU2	KU3	KU4	CS1	CS2	CS3	CS4	PS1	PS2	PS3	PS4
18AHG101	✓											
18AHG102											✓	
18AHG103												
18AHG104				✓								
18AHG105		✓										
18AHG106										✓		
18AHG107										✓		
18AHG108			✓									
18AHG109												
18AHG110												
18AHG111					✓	✓	✓					
18AHG112					✓	✓	✓					
18AHG113					✓	✓	✓					
18AHG114					✓	✓	✓					
18AHG115												
18AHG116												
18AHG201					✓	✓	✓					
18AHG202					✓	✓	✓					
18AHG203					✓	✓	✓					
18AHG204												
18AHG205												
18AHG206												
18AHG207	✓								✓	✓		
18AHG208												
18MRT211		✓										
18MRT212			✓									
18BMRT2			✓		✓							
18MRT214	✓											
18BMRT2												
18MRT301									✓	✓		
18MRT302				✓							✓	
18MRT303					✓							✓
18MRT304												
18OFF31x												
18MRT311											✓	
18MRT312							✓					
18MRT313							✓					
18BMRT3												
18OFF32x												
18MRT401								✓				
18MRT402								✓			✓	✓

29. Capability / Transferable Skills Map

Course Code	Skills									
	GK	SL	WC	OC	P	B	IM	PM	L	
18AHG101A	✓	✓	✓							
18AHG102A							✓			
18AHG103A						✓				✓
18AHG104A	✓	✓	✓							
18AHG105A	✓	✓	✓							
18AHG106A	✓	✓	✓							
18AHG107A						✓		✓		✓
18AHG108A						✓		✓		✓
18AHG109A				✓		✓				
18AHG110A										
18HST101A	✓	✓			✓	✓				
18AHG111A	✓	✓	✓		✓					
18AHG112A	✓	✓	✓		✓					
18AHG113A	✓	✓	✓		✓					
18AHG114A	✓	✓	✓		✓					
18AHG115A				✓	✓			✓		✓
18AHG116A										
18AHG201A	✓	✓	✓		✓					
18AHG202A	✓									
18AHG203A	✓	✓	✓		✓					
18AHG204A	✓	✓	✓		✓					
18AHG205A	✓	✓	✓		✓					
18AHG206A	✓	✓	✓		✓					
18AHG207A	✓	✓								
18AHG208A	✓			✓				✓		✓
18MRT211A	✓	✓	✓							
18MRT212A	✓	✓	✓							
18BMRT213	✓	✓	✓							
18MRT214A	✓	✓	✓							
18BMRT215			✓	✓	✓	✓	✓	✓		✓
18MRT301A	✓	✓	✓	✓		✓				
18MRT302A	✓	✓	✓							
18MRT303A				✓		✓	✓			
18MRT304A			✓	✓	✓	✓	✓	✓		✓
18OFE31xA										
18MRT311A			✓	✓		✓				
18MRT312A	✓	✓	✓	✓						
18MRT313A			✓	✓			✓			
18BMRT314			✓	✓	✓	✓	✓	✓		✓
18OFE32xA										
18MRT401A	✓	✓	✓	✓	✓	✓	✓			
18MRT402A	✓	✓	✓	✓	✓	✓	✓	✓		✓

GK: Group Work; SL: Self Learning; WC: Written Communication; OC: Oral Communication P: Presentation; B: Behavioral; IM: Information Management; PM: Personal Management L: Leadership

30. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposium, paper writing, attending industry exhibitions, project competitions and related activities to enhance their knowledge and network.

31. Cultural and Literary Activities

To remind and ignite the creative endeavors annual cultural festivals held and the students are made to plan and organize the activities.

32. Sports and Athletics

Students are encouraged to develop a habit of taking part in outdoor and indoor games on regular basis.