

INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF PARAMEDICAL SCIENCES

MASTERS OF MEDICAL RADIOLOGICAL IMAGING SCIENCES (MMRIS)

SYLLABUS

YEAR/ SEMESTER: II/III



Integral University, Lucknow Department of Paramedical Sciences Study and Evaluation Scheme

Program: MMRIS
Semester-III

S.	S. Course code	Course Title	Type of		Period Per/week/sei	-]	Evaluation	Scheme		Sub.	Credit	Total
14.	code	Course Title	Paper	L	T	P	CT	TA	Total	ESE	Total	Credit	Credits
					TH	EORIES							
1	RS601	Quality Assurance and Quality Control in Diagnostic Radiology and Imaging	Core	3	1	0	40	20	60	40	100	3:1:0	4
2	RS602	Interventional & Nuclear Medicine Techniques	Core	3	1	0	40	20	60	40	100	3:1:0	4
3	RS603	Research Methodology and Biostatics	Core	3	1	0	40	20	60	40	100	3:1:0	4
					PR	ACTICAL	1						
1	RS604	Synopsis	Core	0	3	0	50	50	00	00	100	0:3:0	3
2	RS605	Residency – III Lab	Core	0	0	10	40	20	60	40	100	0:0:5	5
3	RS606	Quality Assurance and Quality Control in Diagnostic Radiology and Imaging - Lab	Core	0	0	8	40	20	60	40	100	0:0:2	2
4	RS607	Interventional & Nuclear Medicine Techniques – Lab	Core	0	0	8	40	20	60	40	100	0:0:2	2
		Total		09	06	26	290	170	360	240	700	24	24

S.	~		Type		Attributes									
N.	Course	Course Title	of Paper	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	Sustainable Development Goal (SDGs)			
		THEORIES												
1		Quality Assurance and Quality Control in Diagnostic Radiology and Imaging	Core	√	√	√			√	√	3,4			
2	RS602	Interventional & Nuclear Medicine Techniques	Core	V	V	√	$\sqrt{}$		V		3,4			
3	RS603	Research Methodology and Biostatics	Core	√	$\sqrt{}$	V			√	√	3,4			
		PRACTICAL												
1	RS604	Synopsis	Core	V	V	√			√	V	3,4			
2	RS605	Residency – III Lab	Core	V	V	√	V		√	V	3,4			
3		Quality Assurance and Quality Control in Diagnostic Radiology and Imaging - Lab	Core	√	√	1	√		√	√	3,4			
4	RS607	Interventional & Nuclear Medicine Techniques – Lab	Core	V	V	V	V		V	V	3,4			

L: Lecture T: Tutorials P: Practical CT: Class Test TA: Teacher Assessment ESE: End Semester Examination,

AE= Ability enhancement, DSE- Discipline Specific Elective, **Sessional Total:** Class Test + Teacher Assessment Semester Examination (ESE) **Subject Total:** Sessional Total + End



			<u> </u>				
Effective from Session	n: 2024-25						
Course Code	RS601	Title of the Course	Quality Assurance and Quality Control in Diagnostic Radiology and Imaging	L	Т	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	Nil	Co-requisite	Nil				
Course Objectives	The objective is	to learn the aim, object	ive, philosophy and principle of Quality control, Quality	Assu	ance a	nd Care	&

	Course Outcomes: After the successful course completion, learners will develop following attributes:
CO1	Student will have knowledge on Objectives of Quality Control & Quality Assurance.
CO2	Student will have knowledge on QA of Image Receptors & QA Program Tests.
CO3	Student will have knowledge on QA & QC of Cassette, Film and Care and Maintenance.
CO4	Student will have knowledge about care and maintenance of equipments in radiology department.
CO5	Student will have knowledge about QA & QC of Advance Modalities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	INTRODUCTION TO QUALITY CONTROL & QUALITY ASSURANCE	 Quality Control: Objectives of Quality Control, Improve the quality of imaging thereby increasing the diagnostic value; To reduce the radiation exposure; Reduction of film wastage and repeat examination; To maintain the various diagnostic and imaging units at their optimal performance. Quality Assurance: Basic concepts of quality assurance, Equipment selection phase; Equipment installation and acceptance phase; Operational phase; Preventive maintenance. 	8	CO1
2	QA PROGRAMME IN THE RADIOLOGICA L FACULTY LEVEL	Quality Assurance Programme in the Radiological Faculty level: Responsibility, Purchase, Specifications, Acceptance, Routine testing, Evaluation of results of routine testing, Quality assurance practical exercise in the X ray generator and tube, Image receptors, Radiographic equipment, Fluoroscopic equipment, Mammographic equipment, Conventional tomography, Computed tomography, Film processing, manual and automatic, Consideration for storage of film and chemicals, Faults tracing, Accuracy of imaging, Image distortion for digital imaging devices.	8	CO2
3	QA TESTS	Quality Assurance Programme Tests: General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually, Machine calibration, LASER printer, Light beam alignment. X-ray out-put and beam quality check, KVp check, Focal spot size and angle measurement, Timer check, mAs test, Grid alignment test, High and low contrast resolutions, Mechanical and electrical checks, Cassette leak check, Proper screen-film contact test, Safe light test, Radiation proof test, Field alignment test for fluoroscopic device, Resolution test, Phantom measurements, CT, US and MRI.	8	CO3
4	ROUTINE CARE AND MAINTENANCE	Maintenance and care of equipment: Safe operation of equipment, Routine cleaning of equipment and instruments, Cassette, screen maintenance, Maintenance of automatic processor and manual processing unit & Routine maintenance of equipments. Record keeping and log book maintenance; Reject analysis and objectives of reject analysis programme. General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment.	8	CO4
5	QA & QC OF ADVANCE MODALITIES	Quality Assurance and quality control of Modern Radiological and Imaging Equipment which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and PACS related. Image artifacts their different types, causes and remedies.	8	CO5

Reference Books:

- 1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014Mar12.
- 2. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical LibraryAssociation,1996.
- 3. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences; 2016 Sep6
- 4. Durrani SA, IlicR, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. World scientific
- 5. Turner JE. Atoms, radiation, and radiation protection. John Wiley & Sons; 2008Jan8

e-Learning Source:

- 1. https://en.wikipedia.org/wiki/Radiation_protection
- 2. https://youtu.be/mvjYRGjrKHc
- 3. https://www.slideshare.net/RubiSapkota/radiation-protection-and-personnel-monitoring-devices

						Course	Articu	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4						
CO1	3	3	3	3	2	2	3	3	3	3	3	3	2	2	3	3						

CO2	2	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3
CO3	3	3	3	2	3	3	3	3	2	2	3	3	2	2	2	3
CO4	3	3	2	3	2	3	2	3	3	2	3	3	3	3	2	2
CO5	2	3	3	3	2	3	2	3	2	2	2	3	2	3	2	3

Course Code	Course Title			Att	tributes				SDGs
	Quality Assurance and	Employability	Entermonoverhin	Skill	Gender	Environment &	Human	Professional	No.
	Quality Control in	Employability	Entrepreneurship	Development	Equality	Sustainability	Value	Ethics	
RS601	Diagnostic Radiology and Imaging	√	\checkmark	\checkmark			$\sqrt{}$	√	3,4



Effective from Session: 2	2024-25										
Course Code	RS602	Title of the Course	Interventional & Nuclear Medicine Techniques	L	Т	P	С				
Year	II	Semester	3	1	0	4					
Pre-Requisite	Nil	Co-requisite	Nil								
Course Objectives	Course Objectives The objective is to learn about the special procedures done with the interventional approaches in radiology department and Nuclear Medicine Technologies.										

	Course Outcomes												
CO1	At the end of the course, student will have knowledge on: Equipment, procedure, technique and outcome of angiography & Arthrography.												
CO2	At the end of the course, student will have knowledge on Interventional Procedures Cardiac, Vascular, and Nonvascular.												
CO3	Students will have the Knowledge about Basic principle, instrumentation and clinical application of nuclear medicine Technology.												
CO4	Students will have the Knowledge about Radioactive transformation												
CO5	Students will have the Knowledge about Production, handling & transportation of radio-nuclides.												

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	INTRODUCTION TO INTERVENTIONAL RADIOLOGY	Introduction to Interventional Radiology: Need for interventional procedures, History, technique, patient care, Percutaneous catheterization, catheterization sites, Asepsis, Guide wire, catheters, pressure injectors, accessories. All forms of diagnostic procedures including angiography, angioplasty, biliary examination, renal evaluation and drainage procedure and aspiration cytology under fluoroscopy, CT, USG, MRI guidance. Digital Subtraction Angiography (DSA), Types, Instrumentation.	10	CO1
		Angiography: Angiographic Equipment, Catheters & guide wires, Single and biplane angiographic equipment, Angiographic Table, Image intensifier, Flat panel detector, electromechanical injectors.		
2	ANGIOGRAPHY & VENOGRAPHY	Carotid Angiography (4 Vessel angiography), Thoracic and Arch Aortography. Vertebral angiography, femoral arteriography. Selective studies: Renal, SMA, Coeliac axis. Angiocardiography. Venography: Peripheral venography, Cerebral venography, Inferior and superior Venocavography, Relevant visceral phlebography.	8	CO2
3	INTRODUCTION TO NMT	Introduction to NMT and Radioactive Transformation, Basic atomic and nuclear physics, History of radioactivity, Units & quantities, Isotopes, Isobars, Isomers, Radioactivity and half-life, Exponential decay, specific activity, Modes of Radioactive decay, parent daughter decay.	8	CO3
4	PRODUCTION OF RADIO NUCLIDES & EQUIPMENT OF NMT	Production of Radio nuclides, Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators, equipments of NMT, Gamma camera, PET, SPECT (working principle).	8	CO4
5	RADIO PHARMACY & HANDLING & TRANSPORT OF RADIO- NUCLIDES	Radio pharmacy & Handling & Transport of Radio-nuclides Cold kits, Radio pharmacy used in nuclear medicine, Radiopharmaceuticals used in various procedures, Safe handling of radioactive materials, Procedures for handling spills.	6	CO5

Reference Books:

- 1. Kandarpa K, Machan L, editors. Handbook of interventional radiologic procedures. Lippincott Williams & Wilkins; 2011.
- Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.
- Cherry SR, Sorenson JA, Phelps ME. Physics in Nuclear Medicine E-Book. Elsevier Health Sciences; 2012 Feb 14.
- Bomford CK, Miller J, Kunkler H, Sherriff IH, Bomford SB, IH Kunkler SB. Walter and Miller's textbook of radiotherapy: radiation physics, therapy, and oncology. 1993.

 5. Sutton, David. "A textbook of radiology and imaging." (1987).

e-Learning Source:

- https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/interventional- $\underline{radiology\#: \sim: text=What\%20 is\%20 interventional\%20 radiology\%3F, ultrasound\%20 help\%20 guide\%20 the\%20 radiologist.}$
- https://www.cdc.gov/nceh/radiation/nuclear_medicine.htm#:~:text=Nuclear%20medicine%20uses%20radioactive%20material,x%2Drays%3A%20 how%20thev%20work
- https://www.iaea.org/resources/rpop/health-professionals/nuclear-medicine

						Course	Articul	ation M	atrix: (M	apping of	COs with	POs and l	PSOs)			
PO-PSO	POLLPO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3												PSO4			
CO	101	102	103	101	103	100	107	100	10)	1010	1011	1012	1501	1502	1503	1501
CO1	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	2	3	2	3	2	3	2	2

CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2	3

Course Code	Course Title		Attributes									
RS602	Interventional & Nuclear	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.			
	Medicine Techniques	$\sqrt{}$	√	√	√		√	√	3,4			



Effective from Sessi	on: 2024-25						
Course Code	RS603	Title of the Course	Research Methodology and Biostatics	L	T	P	C
Year	II	Semester	Ш	3	1	0	4
Pre-Requisite	Nil	Co-requisite	Nil				
Course Objectives	inferences from the	research findings. The	students understand the basic principles of research and restudents will also be made aware of the need of biostatistic given information about the relation between data and variance.	ics and			

Course	Outcomes
CO1	Apply the principles of research and biostatistics to health practice including the design and implementation of health-
	related research studies.
CO2	Plan and execute a research study, including clinical trials.
CO3	Use / organize bio-statistical analysis using computers and software's and prepare reports.
CO4	Critically evaluate research activities.
CO5	Make recommendations on policy and procedures. Plan and conduct an educational session.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	RESEARCH METHODOLOGY & DESIGN	Research Methodology: Introduction to research methods, identifying research problem. Ethical issues in research- Research design, Basic Concepts of Biostatistics.	08	CO1
2	DATA TYPES	Types of Data- Research tools and Data collection methods, sampling methods, Developing a research proposal.	08	CO2
3	BIOSTATISTICS	Biostatistics: Need of biostatistics, what is biostatistics: beyond definition, understanding of data in biostatistics, how & where to get relevant data, Relation between data & variables. Type of variables: defining data set, Collection of relevant data: sampling methods	08	CO3
4	INTERPRETATION	Normal Distribution, Standard deviation, Standard errors. Coefficient of Variation, t-test, Chi square test.	08	CO4
5	STATISTICAL ANALYSIS	Construction of study: population, sample, normality and its beyond (not design of study, perhaps), Summarizing data on the pretext of underlined study. Understanding of statistical analysis (not methods)	08	CO5

Reference Books:

- 1. Statistical Methods by S.P. Gupta
- 2. Methods in biostatistics for medical students by B.K.Mahajan
- 3. RPG Biostatistics by Himanshu Tyagi

e-Learning Source:

- 1. https://www.youtube.com/watch?v=UtivXLO7c9A&list=PLR3klPR1Qzzky45nZ4 1HlUCbjVNU0iZx
- 2. https://www.youtube.com/watch?v=txlS0N0l9xU&list=PLEIbY8S8u DK7i4Fj6Hgq8sn I42k9H1L
- 3. https://www.youtube.com/watch?v=tr8M7jSlYm4

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	2	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	2	3	3

Course Code	Course Title		Attributes								
RS603	Research Methodology	Employability	Employability Entrepreneurship Skill Gender Environment & Sustainability		Human Value	Professional Ethics	No.				
	and Biostatics	√	√	V	√	Sustamaomity	√aiue	√	3,4		



Effective from session:	2023-24												
Course Code	RS604	Title of the Course	SYNOPSIS	L	T	P	C						
Year	II	Semester	Ш	0	3	0	3						
Pre-Requisite	Nil	Co-requisite	Nil										
Course Objectives		rough the synopsis of Project work/Dissertation., students are expected to carry out innovative project work and prove their alytical ability and practical skills obtained in the area that they have specialized in. This course also would build the research											
	acumen aı	men among students who are interested to pursue research as their career.											

	Course Outcomes
CO1	Students will identify the research problems associated with forensic science and criminalistics
CO2	Students will review the literatures and will be able to decide the topic.
CO3	Students will appraise the research work conducted in relation to topic chosen.
CO4	Students will decide the techniques and methodology for performing the research.
CO5	Students will present the synopsis of the topic chosen for Project work/Dissertation.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO				
	Review the literatures	1. Students are expected to decide on the specific project area and title and review the literatures of that specific topic.						
	Title	2. Decide the title of the Project work/ Dissertation/ Thesis.						
1-5	Formatting the Synopsis	3. Decide the methodology for performing the research and formatting the synopsis.	30 Hrs.	CO1-CO5				
1-3	Presentation and viva-voce	4. Presentation of the Synopsis and viva voce examination for the same will be Conducted.	50 THS.	CO1-CO3				
	Final Report of Synopsis	5. The final synopsis report will be evaluated by a panel of examiners consisting of HOD, Guide, and Co-guide (wherever applicable).						
Reference Books:								

- 1. K. Ramakant; Elementary Statistics in a world of applications, Goodyear California Pub. Co.,1979
- 2. K. D. Broota, Experimental designs in psychological research, Wiley eastern, New York, 1992
- 3. Statistical Methods by S.P. Gupta.
- 4. Research methodology by CR Kothari

EVALUATION OF SYNOPSIS

MMRIS.: Students has to prepare synopsis report and oral presentation; each student will be assessed in a 20 minutes time (15 min for presentation & 5 minutes for discussion). The evaluation of synopsis will be done by a panel of examiners with proper approval of concern authorities. The evaluation for internal examination of 100marks will be distributed:

Work done during the Synopsis Period: 50

Synopsis Report: 25 Presentation and Viva Voce: 25 Total: 100

						Cours	se Artio	culation	n Matri	x: (Map	ping of (COs with	POs and	l PSOs)				
PO- PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO																		
CO1	3	3	2	3	3	2	3	3	2	3	2	3	3	3	3	3	3	2
CO2	2	3	3	3	2	3	3	3	2	2	2	3	3	3	3	3	2	3
CO3	3	2	2	2	3	2	3	3	3	3	2	3	2	2	2	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3	2	3	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	2	3	2	3	3	3	3	3	2	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

				Attributes &	z SDGs							
Course Code	Course Title		Attributes									
RS604	~~~~	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.			
	SYNOPSIS	√	$\sqrt{}$	√			√	√	3,4			



Effective from Sessi	on: 2024-25									
Course Code	RS605	Title of the Course	Residency – III Lab	L	T	P	C			
Year	II	Semester	Ш	0	0	10	5			
Pre-Requisite	Nil	Co-requisite	Nil							
Course Objectives	The objective	objective of the Residency Lab is to learn about patient handling, radiation protection and procedures done in the								
Course Objectives	department.									

	Course Outcomes: After the successful course completion, learners will develop following attributes:
CO1	Students will be able to learn how to deal with a patient during examination in the Radiology department.
CO2	Students will be able to learn how to perform X-Ray Examinations.
CO3	Students will be able to learn how to perform contrast studies along with their preparation and management.
CO4	Students will be able to learn how to perform ward mobile radiography on critically ill patients.
CO5	Students will be able to learn how to perform CT scans, MRI, Fluoroscopy and Mammography.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	COURSE CONTENTS	In the residency, the professional is expected to work and contribute in the medical imaging unit.	100	CO1, CO2, CO3, CO4, CO5

Reference Books:

- Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical.
- Applications and Quality Control. Elsevier Health Sciences; 2015 Sep 2.
- Lakhkar B N, Banavali S, Shetty C. Radiological quiz-head and neck. Indian Journal of Radiology and Imaging.
- Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.
- 5. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic cardiology. Lippincott Williams & Wilkins; 1990.
- 6. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar20.
- Zwiebel WJ, Sohaey R. Introduction to ultrasound. WB Saunders Company;1998.
- 8. Hagen-Ansert SL. Textbook of diagnostic ultrasonography. Mosby Elsevier;2006.

e-Learning Source:

- https://en.wikipedia.org/wiki/High-resolution computed tomography
 https://youtu.be/IhjbvEnlRrM
- 3. https://en.wikipedia.org/wiki/Doppler_ultrasonography

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	1	2	1	1	1	1	3	1	2	3	3	2
CO2	1	3	2	2	2	1	3	2	1	3	3	2	2	2	3	3
CO3	2	3	3	2	2	3	1	2	1	1	3	2	2	3	3	3
CO4	1	3	2	1	3	1	3	3	1	3	3	3	2	1	3	2
CO5	2	3	1	1	1	1	2	1	1	2	3	1	2	2	3	2

Course Code	Course Title		Attributes								
RS605	Residency – III Lab	Employability	Entrepreneursh ip	Skill Developme nt	Gender Equalit y	Environment & Sustainability	Huma n Value	Professional Ethics	No.		
		$\sqrt{}$	\checkmark	$\sqrt{}$			√	\checkmark	3,4		



Effective from Session	n: 2024-25						
Course Code	RS606	Title of the Course	Quality Assurance and Quality Control in Diagnostic Radiology and Imaging- Lab	L	Т	P	C
Year	II	Semester	Ш	0	0	4	2
Pre-Requisite	Nil	Co-requisite	Nil				
Course Objectives	-	learn the aim, objective	, philosophy and principle of Quality control, Quality	Assur	ance ar	d Care	&
Course objectives	Maintenance.						

	Course Outcomes: After the successful course completion, learners will develop following attributes:
CO1	Student will have knowledge on Objectives of Quality Control & Quality Assurance.
CO2	Student will have knowledge on QA of Image Receptors & QA Program Tests.
CO3	Student will have knowledge on QA & QC of Cassette, Film and Care and Maintenance.
CO4	Student will have knowledge about care and maintenance of equipments in radiology department.
CO5	Student will have knowledge about QA & QC of Advance Modalities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	COURSE CONTENTS	1. Objectives of Quality Control 2. Quality Assurance activities 3. Quality assurance programme in the radiological faculty level 4. Quality assurance program tests 5. General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually, machine calibration 6. Basic concepts of quality assurance 7. Quality assurance of film and image recording devices: 8. Maintenance and care of equipment: 9. Care and maintenance of diagnostic equipment: 10. Quality Assurance and quality control of Modern Radiological and Imaging Equipment	80	CO1, CO2, CO3, CO4, CO5

Reference Books:

- 1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014Mar12.
- 2. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical LibraryAssociation,1996.
- 3. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences; 2016 Sep6
- 4. Durrani SA, IlicR, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. World scientific
- 5. Turner JE. Atoms, radiation, and radiation protection. John Wiley & Sons; 2008Jan8

e-Learning Source:

- 1. https://en.wikipedia.org/wiki/Radiation protection
- 2. https://youtu.be/mvjYRGjrKHc
- 3. https://www.slideshare.net/RubiSapkota/radiation-protection-and-personnel-monitoring-devices

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO	101	1 02	103	104	103	100	107	100	10)	1010	1011	1012	1301	1302	1303	1504
CO1	3	3	3	3	2	2	3	3	3	3	3	3	2	2	3	3
CO2	2	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3
CO3	3	3	3	2	3	3	3	3	2	2	3	3	2	2	2	3
CO4	3	3	2	3	2	3	2	3	3	2	3	3	3	3	2	2
CO5	2	3	3	3	2	3	2	3	2	2	2	3	2	3	2	3

Course Code	Course Title		Attributes						
	Quality Assurance and Quality Control in	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.
RS606	Diagnostic Radiology and Imaging- Lab	V	V	V	V		V	V	3,4



Effective from Session	: 2024-25									
Course Code	RS607	Title of the Course	Interventional & Nuclear Medicine Techniques – Lab	L	Т	P	С			
Year	П	Semester	Ш	0	0	4	2			
Pre-Requisite	Nil	Co-requisite	Nil							
Course Objectives	3	e objective is to learn about the special procedures done with the interventional approaches in radiology department and aclear Medicine Technologies.								

	Course Outcomes
CO1	At the end of the course, student will have knowledge on: Equipment, procedure, technique and outcome of angiography & Arthrography.
CO2	At the end of the course, student will have knowledge on Interventional Procedures Cardiac, Vascular, and Nonvascular.
CO3	Students will have the Knowledge about Basic principle, instrumentation and clinical application of nuclear medicine Technology.
CO4	Students will have the Knowledge about Radioactive transformation
CO5	Students will have the Knowledge about Production, handling & transportation of radio-nuclides.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	COURSE CONTENTS	 Introduction to Interventional Radiology: Need for interventional procedures. Catheterization, catheterization sites Guide wire, catheters, pressure injectors, accessories. Drainage procedure and aspiration cytology under fluoroscopy, CT, USG, MRI guidance. Digital Subtraction Angiography (DSA), Types, Instrumentation. Angiography Venography NMT and Radioactive Transformation Modes of Radioactive decay, parent daughter decay. Production of Radio nuclides Gamma camera PET SPECT Radio pharmacy & Handling & Transport of Radio-nuclides 	80	CO1, CO2, CO3, CO4, CO5

Reference Books:

- 1. Kandarpa K, Machan L, editors. Handbook of interventional radiologic procedures. Lippincott Williams & Wilkins; 2011.
- 2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.
- 3. Cherry SR, Sorenson JA, Phelps ME. Physics in Nuclear Medicine E-Book. Elsevier Health Sciences; 2012 Feb 14.
- Bomford CK, Miller J, Kunkler H, Sherriff IH, Bomford SB, IH Kunkler SB. Walter and Miller's textbook of radiotherapy: radiation physics, therapy, and oncology. 1993.
- 5. Sutton, David. "A textbook of radiology and imaging." (1987).

e-Learning Source:

- https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/interventionalradiology#:~:text=What%20is%20interventional%20radiology%3F,ultrasound%20help%20guide%20the%20radiologist.
- 2. https://www.cdc.gov/nceh/radiation/nuclear-medicine.htm#:~:text=Nuclear%20medicine%20uses%20radioactive%20material,x%2Drays%3A%20-how%20they%20work
- 3. https://www.iaea.org/resources/rpop/health-professionals/nuclear-medicine

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO																
CO1	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3
CO2	2	3	2	2	3	3	3	3	2	3	3	2	2	3	3	3
CO3	3	2	3	2	3	2	3	3	2	2	3	3	2	3	3	3
CO4	2	3	2	3	3	3	2	3	3	2	3	3	2	3	3	2
CO5	2	3	3	3	2	3	2	3	2	3	2	3	2	3	2	3

Course Code	Course Title		Attributes									
	Interventional & Nuclear	Employability	Entrepreneurship	Skill	Gender	Environment &	Human	Professional	No.			
RS607	Medicine Techniques –	Employability	Entrepreneursing	Development	Equality	Sustainability	Value	Ethics				
K5007	Lab			√					3,4, 11			
	Lau		l	1					1			



INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF PARAMEDICAL SCIENCES

MASTERS OF RADIOLOGICAL IMAGING SCIENCES (MMRIS)

SYLLABUS

YEAR/ SEMESTER: II/IV



Integral University, Lucknow Department of Paramedical Sciences Study and Evaluation Scheme

Program: MMRIS Semester-IV

S. N.	Course				Period Per hr/week/sem		Evaluation Scheme				Sub. Total	Credit	Total
14.	code	Course Tide	of Paper	L	T	P	CT	TA	Total	ESE		Credit	Credits
	THEORIES												
1	RS608	Advanced CT, MRI & USG	Core	3	1	0	40	20	60	40	100	3:1:0	4
2	RS609	RS609 Patient Care in Diagnostic Radiology		3	1	0	40	20	60	40	100	3:1:0	4
				Pl	RACTIC	AL							
1	RS610	Seminar	Core	0	3	0	50	50	100	00	100	0:3:0	3
2	RS611	Residency – IV Lab	Core	0	0	10	40	20	60	40	100	0:0:5	5
3	RS612	Advanced CT, MRI & USG Lab	Core	0	0	8	40	20	60	40	100	0:0:4	4
4	RS613	Dissertation	Core	0	10	0	40	20	60	40	100	0:10:0	10
		Total		06	15	18	250	150	400	200	600	30	30

S.	Course		Type			United Nation Sustainable					
S. N.	code	Course Title	of Paper	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	Development Goal (SDGs)
T	HEORIES										
1	RS608	Advanced CT, MRI & USG	Core	√	V	√	V		√	√	3,4
2	RS609	Patient Care in Diagnostic Radiology	Core	V		√	V		\checkmark	V	3,4
PR	ACTICAL										
1	RS610	Seminar	Core	V		√			\checkmark	V	3,4
2	RS611	Residency – IV Lab	Core	√	√	√	V		√	√	3,4
3	RS612	Advanced CT, MRI & USG Lab	Core	$\sqrt{}$	√	√	V		√	√	3,4
4	RS613	Dissertation	Core	√	V	√	V		√	√	3,4

L: Lecture T: Tutorials P: Practical CT: Class Test TA: Teacher Assessment ESE: End Semester Examination,

AE= Ability enhancement, DSE- Discipline Specific Elective, **Sessional Total:** Class Test + Teacher Assessment Examination (ESE)

Subject Total: Sessional Total + End Semester



Effective from Sessio	Effective from Session: 2024-25								
Course Code	RS608	Title of the Course	Advanced CT, MRI & USG	L	T	P	C		
Year	II	Semester	IV	3	1	0	4		
Pre-Requisite	Nil	Co-requisite	Nil						
Course Objectives	The objective is to le	arn about the recent adv	ancements & new imaging modalities. Outline of advanced	CT/ M	RI/ US	G &			
Course Objectives	Doppler.								

	Course Outcomes
CO1	At the end of the course, student will have knowledge on: Latest upgraded hardware & software of different imaging modalities.
CO2	Students will have abundant Knowledge on New techniques used to achieve images for special conditions. Various post processing techniques.
CO3	Students will have Knowledge on Techniques of sonography-selection- Preparations - instructions and positioning of patient for TAS, TVS,
	TRUS, neck USG and extremities- biopsy procedures, assurance to patients.
CO4	Students will have Knowledge on CT of head and neck – thorax – abdomen – pelvis – Musculo skeletal system – spine – PNS. Anatomy–
	clinical indications and contraindications – patient preparation – technique – contrast media-types.
CO5	Students will have abundant Knowledge on injection technique; timing, sequence - image display - patient care - utilization of available
	techniques & image processing facilities to guide the clinician- CT anatomy and pathology of different organ systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	HELICAL & MDCT SCAN	Helical CT scan: Slip ring technology, advantages, Multi detector array helical CT, cone – beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT Post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose	06	CO1
2.	MRI IMAGING METHODS	MRI imaging methods – Head and Neck, Thorax, Abdomen, Musculoskeletal System imaging, Clinical Indications and Contraindications, types of common sequences on imaging Protocols for various studies, Slice section, patient preparation, Positioning of the patient, Plain studies, Contrast studies, Special procedures, Reconstructions, 3D images, MRS blood flow imaging, diffusion/perfusion scans, strength and limitations of MRI.	08	CO2
3.	TECHNIQUES OF SONOGRAPHY	Techniques of sonography, selection, Preparations, instructions and positioning of the patient for TAS, TVS, TRUS, neck USG and extremities, Biopsy procedures, assurance to patients.	08	CO3
4.	CT OF DIFFERENT BODY PARTS	CT of Head and Neck, Thorax, Abdomen, Pelvis, musculoskeletal system, Spine & PNS. Anatomy, clinical indications and contraindications, patient preparation, technique, contrast media, types, dose, injection technique; timing, sequence, image display, Patient care, Utilization of available techniques & image processing facilities to guide the clinician, CT anatomy and pathology of different organ systems.	10	CO4
5.	NMT FOR DIFFERENT BODY PARTS	In vivo technique, Static and dynamic studies, Thyroid imaging, Imaging of bone, Respiratory system, Urinary system, GI system, Cardiovascular system, Iodine 131 uptake studies, Iodine 131 therapy of thyrotoxicosis and thyroid ablation.	08	CO5

Reference Books

- 1. Faro SH, Mohamed FB, editors. Functional MRI: basic principles and clinical applications. Springer Science & Business Media; 2006 Nov, 22
- 2. Baert AL. Parallel imaging in clinical MR applications. Springer Science & Business Media; 2007 Jan 11.
- 3. Johansen-Berg H, Behrens TE, editors. Diffusion MRI: from quantitative measurement to in vivo neuroanatomy. Academic Press; 2013 Nov 4
- 4. Bernstein MA, King KF, Zhou XJ. Handbook of MRI pulse sequences. Elsevier.
- 5. Recent Trends in medical imaging (CT, MRI and USG)

e-Learning Source:

- 1. <a href="https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/computed-tomography-ct-scan#:~:text=A%20CT%20scan%20is%20a%20diagnostic%20imaging%20procedure%20that%20uses,detailed%20than%20standard%20X%20rays
 <a href="mailto:line.org/health/treatment-tests-and-therapies/computed-tomography-ct-scan#:~:text=A%20CT%20scan%20is%20a%20diagnostic%20imaging%20procedure%20that%20uses,detailed%20than%20standard%20X%20rays
- 2. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/ct-scan

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO	101	102	103	104	103	100	107	100	10)	1010	1011	1012	1501	1502	1503	1504
CO1	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3
CO2	2	3	2	2	3	3	3	3	2	3	3	2	2	3	3	3
CO3	3	2	3	2	3	2	3	3	2	2	3	3	2	3	3	3
CO4	2	3	2	3	3	3	2	3	3	2	3	3	2	3	3	2
CO5	2	3	3	3	2	3	2	3	2	3	2	3	2	3	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

				Attibutes & 5	DUS								
Course Code	Course Title		Attributes										
RS608	Advanced CT, MRI &	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.				
KS000	USG	1	1	Development	Equanty	Sustamaomity	value	Eulics	2.4				
	250	√	V	√	V		V	V	3,4				



Effective from Session	Effective from Session: 2024-25									
Course Code	RS609	L	T	P	C					
Year	II	Semester	Ш	3	1	0	4			
Pre-Requisite	Nil	Nil Co-requisite Nil								
Course Objectives	3	The objective is to learn about the assessment and handling emergencies in the department as well as the infection controls imongst self and the patient.								

	Course Outcomes
CO1	Understanding the concepts of patient care in radiology department with reference to different responsibility of imaging technologist.
CO2	Understanding nursing procedures in radiology including handling of emergency situations.
CO3	Recognizing care of patient during various procedures performed in radiology department and executing first aid.
CO4	Discussing and performing various infection control methods with psychological consideration.
CO5	Implementing effective communication skills with patients and co-workers.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	INTRODUCTION TO PATIENT CARE	Introduction to the patient care, Responsibility of the health care facility, Responsibilities of the Imaging technologist, General patient care, Patient transfer technique, Restraint technique, Aspects of patient comfort, Specific patient conditions, Security of the patient property, obtaining vital signs, Laying up a sterile trolley, IV injection administration.	10	CO1
2	NURSING PROCEDURE IN RADIOLOGY	Nursing procedure in radiology, General abdominal preparation, Clothing of the patient, giving an enema, Handling the emergencies in radiology, First aid in the X-Ray departments, Medicolegal Case.	8	CO2
3	PATIENT CARE DURING VARIOUS INVESTIGATION	Patient care during investigation, GI tract, biliary tract, respiratory tract, gynecology, cardiovascular, lymphatic system, CNS, etc.	8	CO3
4	INFECTION CONTROL	fection control, Isolation technique, Infection source, Transmission modes ocedures, psychological considerations, Sterilization & sterile technique.		CO4
5	PATIENT EDUCATION & COMMUNICATION	Patient education Communication, Patient communication problems, Explanation of examinations, Radiation safety/protection, Interacting with terminally ill patient, Informed consent.	8	CO5

Reference Books:

- 1. Care of patients in diagnostic radiology Chesney & Chesney
- 2. Ehrlich RA, Coakes DM. Patient Care in Radiography-E-Book: With an Introduction to Medical Imaging. Elsevier Health Sciences; 2016 Jan 19.
- 3. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug 7.
- 4. Grol R, Wensing M, Eccles M, Davis D, editors. Improving patient care: the implementation of change in health care. John Wiley & Sons; 2013 Mar 18.
- 5. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20

e-Learning Source:

- 1. https://www.chcollege.org/meaning-of-patient-care
- 2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1705904

		Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3
CO2	2	3	2	2	3	3	3	3	2	3	3	2	2	3	3	3
CO3	3	2	3	2	3	2	3	3	2	2	3	3	2	3	3	3
CO4	2	3	2	3	3	3	2	3	3	2	3	3	2	3	3	2
CO5	2	3	3	3	2	3	2	3	2	3	2	3	2	3	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

				Attributes & SL)Gs				
Course Code	Course Title		Attributes						SDGs
RS609	Patient Care in	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.
K3009	Diagnostic Radiology	√	√	√	√	Sustamaomity	√	√ √	3,4

Effective from Sessio	Effective from Session: 2024-25											
Course Code	RS610	Title of the Course	SEMINAR	L	T	P	C					
Year	II	Semester	IV	0	3	0	3					
Pre-Requisite	Nil	Co-requisite	Nil									
Course Objectives	The objective is to expertise the student in presenting seminars for improvement of self-confidence.											

	Course Outcomes							
CO1	Student will be able to present seminar under concern topic in places like conferences, workshops, meets etc.							
CO2	Student will have the knowledge on Power point presentation.							
CO3	Student will have the presentation skill.							
CO4	Student will have the knowledge on how to prepare a presentation for any event.							
CO5	Student will be able to organize a Seminar, Webinar & Workshop.							

Unit No.	Title of the Unit	Title of the Unit Content of Unit				
1	SEMINAR	1. Each student will be assigned topics for presentations as seminars, will explore recent innovations in the depaRSment of Radiological Imaging Techniques for presenting topics during Seminar and shall be holding group discussions along with in the presence of faculty.	60	CO1-5		

Reference Books:

- 1. Brandon AN, Hill DR. Selected list of books and journals for the small medical library.
- 2. Bulletin of the Medical Library Association. 1981 Apr;69(2):185.
- 3. Recent Research topics in Radio imaging (Diagnostic radiology)
- RSNA (Journals from Radiological Society of North America)
 AJR (American Journal of Radiology)/ (BJR) British Journal of Radiology
- 6. IJR (Indian journal of Radiology)/Internet journal of Radiology

e-Learning Source:

1.https://www.who.int/

2. https://main.mohfw.gov.in/

SEMINAR PRESENTATION ASSESSMENTN FORM

Name of Student:		Session:	
Enrolment Number:		Date:	
Name of Subject:	Seminar	Subject code:	RS306
Topics:			

Criteria	Sub-Criteria	Max. Marks	Marks
			Obtained
Introduction	Use appropriate background information	04	
(Max marks-10)	Has clear statement of purpose	04	
(Max marks-10)	Shows a logical sequence	02	
	Includes accurate information	04	
	Shows up-to-date content	04	
Et1 Ctt	Presents relevant content	04	
Factual Content	Shows in-depth and sufficient details	02	
(Max marks- 20)	Addresses all important issues	02	
	Is selective	02	
	Use of proper English Grammar in the text	02	
Presentation Quality	Has a good design of presentation (appropriate font, type, size, color, matter per slide etc.)	04	
(Max marks-06)	Has a clear verbal expression and eye contact with audience	02	
Response to	Answers question(s) correctly	04	
questions	Has the ability to think on the spot	04	
(Max marks-10)	Shows an ability to defend content of presentation	02	
Time Management (Max. mark-04)	Completes the presentation within allocated time	04	
	Total Marks	50	

Note: In case of Oral Presentation, each student will be assessed in a 20 minutes time (15 min for presentation & 5 min for discussion) out of 50 marks.

Comments/Suggestions:

EVALUATION OF SEMINAR

The evaluation for internal examination of 100 marks will be distributed: Seminar Presentation=**50marks**.

Viva voce =45 marks Attendance=5 marks

					(Course	Articul	lation M	latrix: (N	Tapping o	f COs wit	h POs and	PSOs)			
PO- PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO																
CO1	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	2	3	2	3	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	Course Title		Attributes							
PG(10	SEMINAR	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.	
RS610		√	\checkmark	√			$\sqrt{}$	V	3,4	



Effective from Sessi	Effective from Session: 2024-25										
Course Code	RS611	Title of the Course	Residency – IV Lab	L	T	P	C				
Year	II	Semester	IV	0	0	10	5				
Pre-Requisite	Nil	Co-requisite	Nil								
Course Objectives	The objective of the Residency Lab is to learn about patient handling, radiation protection and procedures done in the										
Course Objectives	department.										

	Course Outcomes: After the successful course completion, learners will develop following attributes:
CO1	Students will be able to learn how to deal with a patient during examination in the Radiology department.
CO2	Students will be able to learn how to perform X-Ray Examinations.
CO3	Students will be able to learn how to perform contrast studies along with their preparation and management.
CO4	Students will be able to learn how to perform ward mobile radiography on critically ill patients.
CO5	Students will be able to learn how to perform CT scans, MRI, Fluoroscopy and Mammography.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	COURSE CONTENTS	In the residency, the professional is expected to work and contribute in the medical imaging unit.	100	CO1, CO2, CO3, CO4, CO5

Reference Books:

- 9. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical.
- 10. Applications and Quality Control. Elsevier Health Sciences; 2015 Sep 2.
- 11. Lakhkar B N, Banavali S, Shetty C. Radiological quiz-head and neck. Indian Journal of Radiology and Imaging.
- 12. Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.
- 13. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic cardiology. Lippincott Williams & Wilkins; 1990.
- 14. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar20.
- 15. Zwiebel WJ, Sohaey R. Introduction to ultrasound. WB Saunders Company;1998.
- 16. Hagen-Ansert SL. Textbook of diagnostic ultrasonography. Mosby Elsevier;2006.

e-Learning Source:

- 4. https://en.wikipedia.org/wiki/High-resolution computed tomography
- 5. https://youtu.be/IhjbvEnlRrM
- 6. https://en.wikipedia.org/wiki/Doppler ultrasonography

					Course	e Articu	ılation	Matrix	: (Map	ping of C	Os with	POs and	PSOs)			
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	1	2	1	1	1	1	3	1	2	3	3	2
CO2	1	3	2	2	2	1	3	2	1	3	3	2	2	2	3	3
CO3	2	3	3	2	2	3	1	2	1	1	3	2	2	3	3	3
CO4	1	3	2	1	3	1	3	3	1	3	3	3	2	1	3	2
CO5	2	3	1	1	1	1	2	1	1	2	3	1	2	2	3	2

				Titti ibutto et b	O G				
Course Code	Course Title			Att	ributes				SDGs
RS611	Residency – IV Lab	Employability	Entrepreneursh ip	Skill Developme nt	Gender Equalit y	Environment & Sustainability	Huma n Value	Professional Ethics	No.
		$\sqrt{}$	$\sqrt{}$		V		$\sqrt{}$	\checkmark	3,4



Effective from Sessio	n: 2024-25						
Course Code	RS612	Title of the Course	Advanced CT, MRI & USG Lab	L	T	P	C
Year	II	Semester	IV	0	0	8	4
Pre-Requisite	Nil	Co-requisite	Nil				
Course Objectives	The objective is to	learn about the recent a	dvancements & new imaging modalities. Outline of advan	nced C	CT/ MR	I/ USG	&
Course Objectives	Doppler.						

	Course Outcomes
CO1	At the end of the course, student will have knowledge on: Latest upgraded hardware & software of different imaging modalities.
CO2	Students will have abundant Knowledge on New techniques used to achieve images for special conditions. Various post processing techniques.
CO3	Students will have Knowledge on Techniques of sonography-selection- Preparations - instructions and positioning of patient for TAS, TVS, TRUS, neck USG and extremities- biopsy procedures, assurance to patients.
CO4	Students will have Knowledge on CT of head and neck – thorax – abdomen – pelvis – Musculo skeletal system – spine – PNS. Anatomy– clinical indications and contraindications – patient preparation – technique – contrast media-types.
CO5	Students will have abundant Knowledge on injection technique; timing, sequence - image display - patient care - utilization of available
	techniques & image processing facilities to guide the clinician- CT anatomy and pathology of different organ systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	COURSE CONTENTS	 Helical CT scan MSCT CT Angiography CT Fluoroscopy HRCT MRI Head and Neck MRI Thorax and Abdomen MRI Musculoskeletal System Patient preparation, Positioning of the patient Contrast studies Techniques of sonography CT of Head and Neck CT of Thorax, Abdomen & Pelvis CT of Spine & PNS NMT of Thyroid imaging NMT of bone and Respiratory system NMT of the Urinary system, GI system and Cardiovascular system 	80	CO1 CO2 CO3 CO4
		18. Iodine 131 uptake studies		CO5

- 1. Faro SH, Mohamed FB, editors. Functional MRI: basic principles and clinical applications. Springer Science & Business Media; 2006 Nov, 22

 2. Baert AL. Parallel imaging in clinical MR applications. Springer Science & Business Media; 2007 Jan 11.

 3. Johansen-Berg H, Behrens TE, editors. Diffusion MRI: from quantitative measurement to in vivo neuroanatomy. Academic Press; 2013 Nov 4

 4. Bernstein MA, King KF, Zhou XJ. Handbook of MRI pulse sequences. Electrons.
- Bernstein MA, King KF, Zhou XJ. Handbook of MRI pulse sequences. Elsevier. Recent Trends in medical imaging (CT, MRI and USG)

e-Learning Source:

- https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/computed-tomography-ct-scan#:~:text=A%20CT%20scan%20is%20a%20diagnostic%20imaging%20procedure%20that%20uses,detailed%20than%20standard%20X%2Drays
- https://www.cancer.gov/publications/dictionaries/cancer-terms/det/ct-scan

				C	ourse A	Articula	ation M	latrix:	(Mapp	ing of C	Os with	POs an	d PSOs)			
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
COI	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3
CO2	2	3	2	2	3	3	3	3	2	3	3	2	2	3	3	3
CO3	3	2	3	2	3	2	3	3	2	2	3	3	2	3	3	3
CO4	2	3	3 2 3 3 3 2 3 3 2 3 3 2 3 3 2													
CO5	2	3	3	3	2	3	2	3	2	3	2	3	2	3	2	3

Course Code	Course Title			Attribu	tes				SDGs
D.C.(10	Advanced CT,	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value		No.
RS612	MRI& USG Lab	√	√	√	√		√	√	3,4



Effective from Session: 2024-25 Course Code RS613 Title of the Course Dissertation L T P C Year II Semester IV 0 10 0 10 Pre-Requisite Nil Co-requisite Nil							
Course Code	RS613	Title of the Course	Dissertation	L	T	P	С
Year	II	Semester	IV	0	10	0	10
Pre-Requisite	Nil	Co-requisite	Nil				
Course Objectives	The objective of the	course is to help the stud	dents making a dissertation presentation.				

	Course Outcomes
CO1	Students will be able to learn how to prepare presentation.
CO2	Students will have abundant Knowledge on explaining the presentation Infront of the Examiners.
CO3	Students will be able to learn about how to do new research in respected field.
CO4	Students will be able to learn about Methods of Data Collection.
CO5	Students will have abundant Knowledge on how to write dissertation and thesis.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	COURSE CONTENTS	It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by staff of the department based on participation of students in various teaching/learning activities. It may be structured and assessment shall be done using checklists that assess various aspects. Model checklists are given which may be copied and used. 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). 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.	200	CO1, CO2, CO3, CO4, CO5

Reference Books:

- 1. S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990.
- $2.\ D\ R\ Whitehat:\ Biochemistry\ of\ the\ Eye,\ 2nd\ edition,\ Butterworth\ Heinemann,\ Pennsylvania,\ 2003$
- 3. S.Ramakrishnan:Essentialsofbiochemistryandocularbiochemistry, Annamalai University Publications, Chidambaram, India, 1992.

e-Learning Source:

- https://www.youtube.com/watch?v=P_WNPIZGvbM https://www.youtube.com/watch?v=P_WNPIZGvbM

	ame of Student collment Number			Sessio Date		
N	ame of Subject	Thesis/D	Pissertation	Subject (Code	RS613
	Topics			-		I
S. No.	Evaluation		Point to be Considered	Max. Marks	Marks	Obtained
1.			Periodic Consultation with Guide	2		
2.	On the bas	:c	Regular collection of Data with the consultation of guide.	2		
3.	continuo	100 01	Command of the topic & presentation skill	2		
4.	assessment (10 Marks)		Methods, analysis, dissuasion and Conclusions	2		
5.	1		Contribution to knowledge and thesis structure	2		
	1		Review all heading	· ·		
1.			Introduction	3		
2.	1		Aims, objectives & research hypothesis	3		
3.	On the bas Extern		Review of literature	3		
4.	Evaluators		Material & Methods	3		
5.	time of End Semester Examination.		Data analysis & results	3		
6.	Examinat	uon.	Discussion, lamination & future study	3		
7.	1		Conclusion, signification.	3		
8.			Bibliography	3		

9.		3		
10.		The deface of study	3	
		40		

Note: Evaluation of Dissertation of MMRIS- Students has to prepare oral presentation; each student will be assessed in a 20 minutes time (15 min for presentation & 5 min for discussion). The evaluation of dissertation by external examiner with proper approval of concern authorities. The end semester examination will be 40 marks as external evaluations and 60 marks will be by the internal examiner (continuous assessment):

Comments/Suggestions:

(Name and signature of Incharge)

(Head, Paramedical)

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	2	3	2	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	2	3	3

Course Code	Course Title	Attributes S									
RS613	Dissertation	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	No.		
		√	√	√	V		V	√	3,4		