INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF PARAMEDICAL SCIENCES

BACHELOR OF SCIENCE IN RADIOLOGICAL IMAGING TECHNOLOGY (B.Sc. RIT)

SYLLABUS

YEAR/SEMESTER: II/III

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

Program: B.Sc. RIT Semester-III

S. N.	Course code	Course Title	Type of Paper	Period Per hr./week/Sem			Evaluation Scheme				Sub. Total	Credit	Total Credits
				L	T	P	CT	TA	Total	ESE			
THEORIES													
1	RT201	Radiographic Positioning- II	Core	3	1	0	40	20	60	40	100	2:1:0	4
2	RT202	Conventional Radiographic Techniques-I	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	RT203	Radiation Protection and Quality assurance	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	RT204	Fundamental of Microbiology & Immunology	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	ES101	Environmental Studies	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	RT206	Radiographic Positioning- II Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
2	RT207	Conventional Radiographic Techniques-I -Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
3	RT208	Radiation Protection and Quality Assurance-Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
4	RT209	Fundamentals of Microbiology & Immunology-Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
Total													

S. N.	Course code	Course Title	Type of Paper	Attributes							United Nation Sustainable Development Goal (SDGs)
				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
THEORIES											
1	RT201	Radiographic Positioning- II	Core	√	√	√			√	√	3,4
2	RT202	Conventional Radiographic Techniques-I	Core	√	√	√	√		√	√	3,4
3	RT203	Radiation Protection and Quality assurance	Core	√	√	√	√		√	√	3,4
4	RT204	Fundamental of Microbiology & Immunology	Core	√	√	√	√		√	√	3,4
5	ES101	Environmental Studies	Core					√			3,4,11,16
PRACTICAL											
1	RT206	Radiographic Positioning- II Lab	Core	√	√	√	√		√	√	3,4
2	RT207	Conventional Radiographic Techniques-I -Lab	Core	√	√	√	√		√	√	3,4
3	RT208	Radiation Protection and Quality Assurance-Lab	Core	√	√	√	√		√	√	3,4
4	RT209	Fundamentals of Microbiology & Immunology-Lab	Core	√	√	√	√		√	√	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 **Subject Total:** Sessional Total + End Semester Examination (ESE)

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT201**	**Title of the Course**	**RADIOGRAPHIC POSITIONING- II**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**3**	**1**	**0**	**4**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn basic and special projections for the better delineation diagnosis of the disease conditions of different anatomical structures (Upper and Lower Extremities, Shoulder Joint, Pelvis Griddle, Whole Spine).						

Course Outcomes	
CO1	Students will be able to learn about Basic and special projection- Related radiological anatomy Upper Extremity and Femur.
CO2	Students will be able to learn Basic and special projections-Related radiological anatomy of Shoulder Girdle.
CO3	Students will be able to learn Basic and special projections of Pelvic girdle.
CO4	Students will be able to learn Related radiological anatomy and Basic views of whole spine.
CO5	Students will be able to learn Positioning, care and radiation protection while handling babies.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**PROJECTIONS OF UPPER & LOWER EXTREMITY**	1. Basic and special projection- Related radiological anatomy. 2. Finger-PA, LAT, OBLIQUE- Hand-PA, LAT- Wrist joint-PA, LAT, Ulnar deviation - Forearm-AP, LAT. 3. Elbow joint-AP, LAT- Humerus-AP, LA. 4. Femur-AP, LAT- Knee joint- AP, LAT- Patella-SKYLINE VIEW-Tibia-AP, LAT-Ankle joint-AP, LAT, MORTIS VIEW- Foot –AP, LAT.	8	CO1
2	**PROJECTIONS OF SHOULDER GIRDLE**	1. Basic and special projections-Related radiological anatomy. 2. Shoulder-AP, AXIAL 3. Clavicle -AP, AP AXIAL 4. Scapula-AP, OBLIQUE, Y VIEW	8	CO2
3	**PROJECTIONS OF PELVIC GIRDLE & PROXIMAL FEMUR**	1. Basic & special projections- Related radiological anatomy 2. Pelvic girdle: AP pelvis, Frog lateral (modified cleaves method), AP axial for pelvic outlet (tayelor method), AP axial for pelvic inlet (modified linienfield method), Posterior oblique-acetabulum (judet method) 3. Hip and proximal femur: AP unilateral hip, Axio-lateral, infero-superior (danelius – miller method), Unilateral frog leg (modified cleaves method), Modified axiolateral (Clements-Nakayama method) 4. Sacrio-iliac joints: AP, posterior oblique's	8	CO3
4	**PROJECTIONS OF WHOLE SPINE**	**1. Cervical spine:** Related radiological anatomy a. Basic views, AP open mouth, AP axial, Oblique, Lateral, Erect, Trauma lateral (horizontal beam), Swimmer's view) b. Special views: Lateral- hyperflexion and hyperextension AP (Fuchs method) or PA (Judd method), AP wagging jaw (ottonello method), AP axial (pillars). 2. **Thoracic spine**: Related radiographic anatomy: Projections, AP, Lateral, and Oblique. 3. **Lumbar spine, sacrum and coccyx: Related radiographic anatomy** a. Lumbar spine: AP, Oblique, Lateral, Lateral (L5 – S1), AP axial (L5 –S1). b. Scoliosis series: AP or PA, Erect, lateral, AP (Ferguson method), AP–Rand L bending. c. Spinal fusion series: AP or PA – R and L bending, Lateral –hyperextension and hyper flexion. 4. **Sacrum and Coccyx:** AP axial sacrum, AP axial coccyx, Lateral sacrum, Lateral coccyx.	8	CO4
5	**PAEDIATRIC RADIOGRAPHY**	**1.** Positioning, and radiation protection while handling babies.	8	CO5

Reference Books:

1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul28.
2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug7.
3. Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017
4. FrankED, LongBW, SmithBJ.Merrill'sAtlasofRadiographicPositioningandProcedures-E-Book. Elsevier Health Sciences; 2013 Aug13.

e-Learning Source:

1. https://www.slideshare.net/InfoUtilRT/upper-extremity-anatomy-positioning
2. https://youtu.be/LlStHhk5e9w

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	2	3	3	3
CO3	3	2	3	3	3	2	3	2	2	3	2	3	3	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	2	3	3	3

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT201	RADIOGRAPHIC POSITIONING- II	√	√	√			√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT202**	**Title of the Course**	**CONVENTIONAL RADIOGRAPHIC TECHNIQUES- I**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The main objective is to aware the student about conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with image formation, developing and reading.						

Course Outcomes	
CO1	Students will be able to learn about Radiation, Sources of radiation, Radioactivity, Half-life, Ionizing & Non-ionizing Radiation, and History of x-ray production.
CO2	Students will be able to learn about Characteristic Radiation, Bremsstrahlung Radiation, X-ray Emission Spectrum, and the Properties of X-ray.
CO3	Students will be able to learn about Image recording systems.
CO4	Students will be able to learn about film processing techniques.
CO5	Students will be able to understand the Fluoroscopy technique.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**RADIATION, RADIOACTIVITY & X-RAYS**	1. Radiation, Types of radiation, Sources of radiation, Radioactivity, its types Half-life, History of x-ray production, Principle of Xray production, Development of modern Radiology X-Ray Tube- External components- X-ray tube support, Protective housing, Glass or metal Enclosure, Internal components- cathode, anode, focusing cup, focal spot, Line focus principle, Heel effect, X-ray tube failure, Rating charts.	6	CO1
2	**TYPES OF X-RAYS & AFFETING FACTORS**	1. Characteristic Radiation, Bremsstrahlung Radiation, X-ray Emission Spectrum, Properties of X-ray, X-ray quality, X-ray quantity, Half value layer. Interaction of x-ray with matter- Coherent scattering, Compton effect, Photoelectric effect, Pair Production, Photodisintegration, Differential absorption.	6	CO2
3	**THE RECORDING SYSTEM**	1. Introduction of X-ray film, its construction, and Types of film. Formation of the latent image, Film storage rules and guidelines, film handling and care 2. Introduction of an Intensifying screen, its construction, Types and properties. Luminescence, screen characteristics. 3. Introduction of Cassette, its construction and types, silver recovery, Film artifact and its types	6	CO3
4	**FILM PROCESSING**	1. Introduction of Film processing, its types (Manual Processing, Automatic processing), Processing sequence, wetting, developing, fixing, washing, Drying, Darkroom, its purpose and location, layout of dark room. Characteristic curve, Optical density, Geometry of Radiographic image- magnification, distortion, focal spot blur, Subject factors.	6	CO4
5	**FLUOROSCOPY**	1. Introduction to fluoroscopy, Techniques of fluoroscopy, Its construction, image intensifier - Construction and working, Flux gain, Brightness gain, Minification gain, Multifield image intensifier, Cathode ray tube.	6	CO5

Reference Books:

1. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar20.
2. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.
3. AdamA, DixonAK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger &Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.
4. D N and M O Chesney- X ray equipments for student radiographers- Third edition.
5. Burgener FA, Kormano M. Differential diagnosis in conventional radiology.
6. The physics of radiology and imaging by K Thayalan.

e-Learning Source:

1. https://youtu.be/SHvAl5yIyS0
2. https://www.slideshare.net/anurajgowda/dark-room-procedures-72201093
3. https://en.wikipedia.org/wiki/Fluoroscopy

	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	1	3	1	2	2	1	3	1	2	2	2	2	2	3	2	3
CO2	1	3	1	3	2	2	2	1	3	3	3	3	3	2	2	1
CO3	1	3	1	2	3	2	3	1	2	1	2	2	3	3	3	2
CO4	1	3	1	2	2	3	2	1	3	2	1	3	2	3	3	3
CO5	1	3	1	2	2	2	2	1	2	2	2	2	2	3	2	3

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT202	CONVENTIONAL RADIOGRAPHIC TECHNIQUES- I	√	√	√	√		√	√	3,4

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT203**	**Title of the Course**	**RADIATION PROTECTION AND QUALITY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn the aim, objective, philosophy and principle of radiation protection to protect oneself from the biological effects of radiation and monitoring radiation exposure.						

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Student will have knowledge on Radiation, Units & Quantities of radiation and Principle of Radiation Protection.
CO2	Student will have knowledge on Radiation Monitoring & Radiobiology.
CO3	Student will have knowledge on Quality control and assessment of equipment installed in radio department.
CO4	Student will have knowledge about care and maintenance of equipments in radiology department.
CO5	Student will have knowledge on Role of Radiographer in QA & QC of equipments.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO RADIATION PROTECTION, UNITS & QUANTITIES**	1. **Introduction to Radiation Protection, Units & Quantities-** Primary, secondary radiation, need for radiation protection, Exposure, absorbed dose, absorbed dose equivalent, Effective dose, air KERMA, Radiation weighting factor, Tissue weighting factor, MPD. 2. **Aim & Principle of Radiation Protection-** Concept of ALARA, Cardinal Principle, ICR Regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding.	6	CO1
2	**RADIATION MONITORING & RADIOBIOLOGY**	1. **Radiation monitoring:** Personnel – Film badge, TLD, OSLD, pocket dosimeter, AreaMonitoring Devices. 2. **Radiobiology:** Radiolysis of water, Direct & Indirect effects of radiation, Stochastic, Deterministic effects, Somatic, Genetic effects, dose relationship, Antenatal exposure. 10-day rule, 14-day rule, 28-day rule, structural shielding, workload, use factor, occupancyfactor.	6	CO2
3	**QUALITY CONTROL AND ASSESSMENT IN RADIOLOGY**	1. **Quality Control and Assessment in Radiology:** Quality Assurance and quality control of Modern Radiological and Imaging Equipment, which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and Tele radiology and PACS.	6	CO3
4	**CARE & MAINTENANCE OF DIAGNOSTIC EQUIPMENTS**	1. **Care and maintenance of diagnostic equipment**: General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment.	6	CO4
5	**ROLE OF RADIOGRAPHER IN PLANNING, QA & RADIATION PROTECTION**	1. **Role of Radiographer in Planning, QA & Radiation Protection**: Role of technologist in radiology department - Personnel and area monitoring. ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection. NABH guidelines, AERB guidelines, PNDT Act and guidelines.	6	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
6. Radiation protection in medical radiography by Mary Alice, Paula J Visconti et.al.

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 / 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

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT203	RADIATION PROTECTION AND QUALITY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT204**	**Title of the Course**	**FUNDAMENTAL OF MICROBIOLOGY & IMMUNOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This subject gives a general insight into the history, basics of microbiology, sterilization and branches of Microbiology.						

Course Outcomes	
CO1	This course makes the students to know about Microscopy & Biomedical waste management.
CO2	This course makes the students to know about general safety in Microbiology Lab & Sterilization
CO3	This course makes the students to know antiseptics & disinfectants.
CO4	This course makes the students to know about antigens & antibodies of immune system.
CO5	This course makes the students to know about branches of Microbiology.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**MICROSCOPY & BIOMEDICAL WASTE MANAGEMENT IN THE LAB**	1. Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. 2. Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal	6	CO1
2	**GENERAL SAFETYAND STERILIZATION**	1. General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization heat, 2. UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators.	6	CO2
3	**ANTISEPTIC AND DISINFECTANTS**	1. Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants 2. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound use and abuse of disinfectants. precautions while using the disinfectants	6	CO3
4	**IMMUNE SYSTEM, ANTIGEN & ANTIBODY**	1. General concepts of the immune system 2. Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens 3. Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies.	6	CO4
5	**INTRODUCTION TO VARIOUS MICRO ORGANISM AND THEIR FEATURES**	1. Introduction to Bacteriology, Virology, Parasitology, Helminthology, Fungi & Protozoa. 2. Brief Discussion on - Structure, life cycle, types, infection caused, diagnosis and treatment by- Common Viruses, Bacteria, Parasites & Helminth.	6	CO5

Reference Books:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8thedition, University Press Publication.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
4. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
6. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8thedition, University Press Publication.

e-Learning Source:

1. https://youtu.be/pB26B2CXi2U
2. https://www.britannica.com/technology/microscope
3. https://www.webmd.com/a-to-z-guides/difference-between-disinfectants-antiseptics

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

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT204	FUNDAMENTAL OF MICROBIOLOGY & IMMUNOLOGY	√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	**ES101**	**Title of the Course**	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The student will have awareness of our environment in general, natural resources, ecosystems, environmental pollution and social issues related to environment.						

Course Outcomes	
CO1	To study about the Environment and the ECO system.
CO2	To study about the Natural Resources.
CO3	To study about Biodiversity and Conservation
CO4	To study Environmental pollution, its policies and practices
CO5	To study Human Population and Environmental Ethics.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO ENVIRONMENT AND ECOSYSTEMS**	1. Environment, its components and segments, Multidisciplinary nature of Environmental studies, Concept of Sustainability and sustainable development, Environmental movements, Ecosystem, Structure & Function, Energy flow in the Ecosystem, Ecological Pyramids and 2. Ecological Succession.	6	CO1
2	**NATURAL RESOURCES**	1. Energy Resources: Renewable and non-renewable, Soil erosion and desertification, 2. Deforestation, Water: Use and over exploitation, Impacts of large Dams, Case studies.	6	CO2
3	**BIODIVERSITY AND CONSERVATION**	3. Levels of biological diversity, Hot spots of biodiversity, India as a Mega Diversity Nation,Endangered and endemic species of India, Threats to Biodiversity, Conservation of 4. Biodiversity, Ecosystem and biodiversity services.	6	CO3
4	**ENVIRONMENTAL POLLUTION, POLICIES AND PRACTICES**	1. Environmental pollution, Solid waste management, Ill effects of fireworks, Climate change, Ozone layer depletion, acid rain and impacts on human communities and Environment. 2. Environmental Laws: Environment Protection Act, Wildlife protection Act, Forest conservation Act, Convention on Biological Diversity (CBD), Tribal rights, Human wildlife conflicts.	6	CO4
5	**HUMAN POPULATION AND THE ENVIRONMENT**	1. Human population growth: Impacts on environment, human health and welfare, Resettlementand rehabilitation of project-affected persons, Environmental ethics, Environmental communication and public awareness, case studies.	6	CO5

Reference Books:

1. Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahemdabad-380, India.
3. Brunner R.C. 1989. Hazardous waste incineration, Mc Graw Hill.
4. Clark R.S. Marine Pollution, Clanderon Press Oxford (TB).
5. Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jaicob Publication House,Mumbai
6. De. A.K. Environmental chemistry Willey Eastern Limited.
7. Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment &security, Stockholm Env, Institute, Oxford Univ, Press 473p.
8. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society,Bombay

e-Learning Source:

1. https://www.vedantu.com/biology/difference-between-environment-and-ecosystem
2. https://en.wikipedia.org/wiki/Natural_resource
3. https://en.wikipedia.org/wiki/Biodiversity

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	2	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	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							SDGs No.
ES101	ENVIRONMENTAL STUDIES	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
						√			**3,4, 11**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT206**	**Title of the Course**	**RADIOGRAPHIC POSITIONING-II LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn basic and special projections for the better delineation diagnosis of the disease conditions of different anatomical structures (Upper and Lower Extremities, Shoulder Joint, Pelvis Griddle, Whole Spine).						

Course Outcomes	
CO1	Students will be able to learn about Basic and special projection- Related radiological anatomy a. Finger, Hand, & Wrist joint.
CO2	Students will be able to learn Basic and special projections-Related radiological anatomy, Forearm, Elbow, Humerus & Femur.
CO3	Students will be able to learn Knee, Patella, Tibia & ankle joint.
CO4	Students will be able to learn Pelvis & Foot Radiography.
CO5	Students will be able to learn Positioning, care and radiation protection while handling babies & Spine Radiography.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**HAND & WRIST RADIOGRAPHY**	1. Demonstration of Finger -PA, LAT, OBLIQUE. 2. Demonstration of Hand-PA, LAT. 3. Demonstration of Wrist joint-PA, LAT.	8	CO1
2	**UPPER EXTREMITY & FEMUR RADIOGRAPHY**	1. Demonstration of Forearm-AP, LAT. 2. Demonstration of Elbow joint-AP, LAT- Humerus-AP, LA. 3. Demonstration of Femur-AP, LAT.	8	CO2
3	**LOWER EXTREMITY RADIOGRAPHY**	1. Demonstration of the Knee joint- AP, LAT, Patella-SKYLINE VIEW 2. Demonstration of Tibia-AP, LAT. 3. Demonstration of Ankle joint-AP, LAT, MORTIS VIEW.	8	CO3
4	**PELVIS & FOOT RADIOGRAPHY**	1. Demonstration of Foot –AP, LAT. 2. Demonstration of Basic & special projections of Pelvic girdle and proximal femur.	8	CO4
5	**SPINE & PEDIATRIC RADIOGRAPHY**	1. Demonstration of Basic & special projections of the Cervical spine 2. Demonstration of Basic & special projections of Lumbar spine & sacrum 3. Demonstration of Pediatric radiography.	8	CO5

Reference Books:

1 Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioningin Radiography 13E. CRC Press; 2015 Jul 28.

2 Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug 7.

3 Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017 Feb 10.

4 Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.

e-Learning Source:

1. https://www.slideshare.net/InfoUtilRT/upper-extremity-anatomy-positioning
2. https://youtu.be/LlStHhk5e9w
3. **https://youtu.be/C2Ud4EwZVQM**

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	2	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	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							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT206	RADIOGRAPHIC POSITIONING- PART II LAB	√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT207**	**Title of the Course**	**CONVENTIONAL RADIOGRAPHIC TECHNIQUES-I LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The main objective is to aware the student about conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with image formation, developing and reading. Students must know about its practical aspects and handling procedures.						

Course Outcomes	
CO1	Students will be able to learn about Radiological imaging techniques.
CO2	Students will be able to learn about X-Ray production.
CO3	Students will be able to learn about X-ray Recording system.
CO4	Students will be able to learn about understanding the Processing of Radiograph.
CO5	Students will be able to understand the Fluoroscopy in detail.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO RADIOLOGIC IMAGING**	1. Introduction to Radiologic Imaging.	8	CO1
2	**X-RAY PRODUCTION**	2. X-Ray Production.	8	CO2
3	**RECORDING SYSTEM**	3. The Recording System.	8	CO3
4	**PROCESSING OF LATENTIMAGE**	4. Processing of Latent Image techniques.	8	CO4
5	**FLUOROSCOPY**	5. Handling of Fluoroscopy.	8	CO5

Reference Books:

1. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.
2. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnosticradiology.
3. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.
4. D N and M O Chesney- X ray equipments for student radiographers- Thirdedition.
5. Burgener FA, Kormano M. Differential diagnosis in conventional radiology.

e-Learning Source:

1. https://youtu.be/SHvAl5yIyS0
2. https://www.slideshare.net/anurajgowda/dark-room-procedures-72201093
3. https://en.wikipedia.org/wiki/Fluoroscopy

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	3	1	2	3	2	1	1	2	3	1	2	2	3	2	**3**
CO2	1	3	1	3	3	3	3	1	3	3	3	3	3	3	3	2
CO3	1	3	1	2	1	2	1	1	2	2	1	2	3	1	2	**3**
CO4	1	3	1	2	2	2	2	1	3	3	2	3	2	2	2	1
CO5	1	3	1	2	1	2	2	1	2	2	2	2	2	1	2	**3**

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT207	CONVENTIONAL RADIOGRAPHIC TECHNIQUES-ILAB	√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT208**	**Title of the Course**	**RADIATION PROTECTION AND QUALITY ASSURANCE-LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn the aim, objective, philosophy and principle of radiation protection to protect oneself from the biological effects of radiation and monitoring radiation exposure.						

Course Outcomes	
CO1	Student will have knowledge on Radiation Protection in Radiography.
CO2	Student will have knowledge on principle of Radiation Protection.
CO3	Student will have knowledge on Radiation Monitoring.
CO4	Student will have knowledge about care and maintenance in radiology.
CO5	Student will have knowledge about QA & QC in Radiology.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRO TO RADIATION PROTECTION & UNITS**	1.Introduction to Radiation Protection, Units & Quantities	8	CO1
2	**PRINCIPLE OF RADIATION PROTECTION**	2.Aim & Principle of Radiation Protection	8	CO2
3	**RADIATION MONITORING**	3.Radiation monitoring	8	CO3
4	**ROLE OF RADIOGRAPHER IN QC & QA**	4.Quality Control and Assessment in Radiology	8	CO4
5	**ROLE OF RADIOGRAPHER IN CARE AND MAINTENANCE**	5.Care and maintenance of diagnostic equipment- 6.Role of Radiographer in Planning, QA & Radiation Protection	8	CO5

Reference Books:

1. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association.1996
2. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014 Mar12.
3. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences; 2016 Sep6
4. Durrani SA, Ilic R, 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
6. www.AERB.com (Guidelines and Details of Quality Control in Radiology).

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 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

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT208	RADIATION PROTECTION AND QUALITY ASSURANCE-LAB	√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT209**	**Title of the Course**	**FUNDAMENTAL OF MICROBIOLOGY & IMMUNOLOGY-LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This subject gives a general insight into the history, and basics of microbiology and imparts knowledge about the equipment used in microbiology and formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.						

Course Outcomes	
CO1	Student will be able to demonstrate microscope, glassware & Autoclave.
CO2	Student will be able to demonstrate hot air oven, Gram stainig & ZN staining.
CO3	Student will be able to perform Indian ink staining, hanging drop method & demonstration of capsule.
CO4	Student will be able to demonstrate bacterial spores and agglutination reactions & RA test.
CO5	Student will be able to perform, Widal, RPR & CRP test.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**MICROSCOPE, GLASSWARE& AUTOCLAVE**	1. Demonstration of Microscope and its parts 2. Demonstration of glassware used in microbiology. 3. Demonstration of autoclave and sterilization of glass wares.	8	CO1
2	**HOT AIR OVEN& ACID FAST AND GRAM STAINING**	1. Demonstration of Hot air oven and sterilization of glass wares. 2. To perform Gram staining 3. To perform Acid-fast staining (Zeihl Neelsen staining)	8	CO1
3	**INK STAINING, HANGING DROP METHOD**	1. To perform Indian ink staining 2. To perform the Hanging drop method 3. Demonstration of capsule	8	CO2
4	**BACTERIAL STAINING & BLOOD TEST**	1. Staining of bacterial spores 2. To demonstrate agglutination reaction. 3. To perform the RA test	8	CO2
5	**BLOOD TEST**	1. To perform the WIDAL test 2. To perform an RPR test. 3. To perform the CRP test	8	CO3

Reference Books:

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11thedition Wiley- Blackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley BlackwellPublication.

e-Learning Source:

1. https://youtu.be/vvFDypILkTA
2. https://youtu.be/sxa46xKfIOY
3. https://www.metropolisindia.com/blog/preventive-healthcare/widal-test-introduction-principle-procedure-preparation-price

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

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT209	FUNDAMENTAL OF MICROBIOLOGY & IMMUNOLOGY-LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF PARAMEDICAL SCIENCES

BACHELOR OF SCIENCE IN RADIOLOGICAL IMAGING TECHNOLOGY (B.Sc. RIT)

SYLLABUS

YEAR/ SEMESTER: II/IV

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

Program: B.Sc. RIT Semester-IV

S. N.	Course code	Course Title	Type of Paper	Period Per hr/week/sem			Evaluation Scheme				Sub. Total	Credit	Total Credits
				L	T	P	CT	TA	Total	ESE			
THEORIES													
1	RT210	Conventional Radiographic Techniques-II	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	RT211	Special Radiographic Procedures	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	RT212	Basics of USG and Mammography	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	RT213	Basics of CT Scan	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	RT214	Orientation in Clinical Sciences-I	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	RT215	Conventional Radiographic Techniques- II Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
2	RT216	Special Radiographic Procedures- Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
3	RT217	Basics of CT Scan-Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
4	RT218	Hospital Posting	Core	0	0	16	40	20	60	40	100	0:0:8	8
Total													

S. N.	Course code	Course Title	Type of Paper	Attributes							United Nation Sustainable Development Goal (SDGs)
				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
THEORIES											
1	RT210	Conventional Radiographic Techniques- II	Core	√	√	√	√		√	√	3,4
2	RT211	Special Radiographic Procedures	Core	√	√	√	√		√	√	3,4
3	RT212	Basics of USG and Mammography	Core	√	√	√	√		√	√	3,4
4	RT213	Basics of CT Scan	Core	√	√	√	√		√	√	3,4
5	RT214	Orientation in Par Clinical Sciences	Core	√	√	√	√	√	√	√	3,4
PRACTICAL											
1	RT215	Conventional Radiographic Techniques- II Lab	Core	√	√	√	√		√	√	3,4
2	RT216	Special Radiographic Procedure- Lab	Core	√	√	√	√		√	√	3,4
3	RT217	Basics of CT Scan-Lab	Core	√	√	√	√		√	√	3,4
4	RT218	Hospital Posting	Core	√	√	√	√		√	√	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 **Subject Total:** Sessional Total + End Semester Examination (ESE)

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT210**	**Title of the Course**	**CONVENTIONAL RADIOGRAPHIC TECHNIQUES- II**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The main objective is too aware the student about the conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with the image formation, developing and reading.						

Course Outcomes	
CO1	Students will be able to learn about portable, Mobile and C-Arm machines of radiology.
CO2	Students will be able to learn about fluoroscopy equipment.
CO3	Students will be able to learn about X-ray and fluoroscopy tables.
CO4	Students will be able to learn about tomography equipment.
CO5	Students will be able to learn about cranial and dental radiography.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**PORTABLE & MOBILE EQUIPMENTS**	1. Portable X-Ray Equipments its mains requirements and application. 2. Mobile X-Ray Equipments, Technical factors, its Cable connections, Capacitor discharge mobile equipment. 3. X-Ray Equipments for the Operating Theatre.	6	CO1
2	**FLUOROSCOPY EQUIPMENTS**	1. Construction & Working principles of Image Intensifier. 2. Direct Fluoroscopy. 3. Viewing the Intensified image. 4. Recording the intensified Image. 5. Digital fluoroscopy.	6	CO2
3	**FLUORO /RADIOGRAPHY TABLES**	1. Introduction of fluoroscopic / radiographic table and its general features. 2. The serial changer. 3. The spot film devices.	6	CO3
4	**TOMOGRAPHIC EQUIPMENT**	1. Principles of Tomography. 2. Various types of Tomographic movement. 3. Equipment for Tomography.	6	CO4
5	**EQUIPMENT FOR CRANIAL AND DENTAL RADIOGRAPHY**	1. The skull table. 2. General Dental X-ray equipment. 3. Dental anatomy 4. Dental radiography	6	CO5

Reference Books:

1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic cardiology. Lippincott Williams & Wilkins; 1990.
2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar20.
3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.
4. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger& Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.
5. D N and M O Chesney- X ray equipments for student radiographers- Thirdedition
6. Burgener FA, Kormano M. Differential diagnosis in conventional radiology

e-Learning Source:

1. https://youtu.be/R2-GB65Wa5w
2. https://youtu.be/JDYG-JEl6kI
3. https://youtu.be/IhjbvEnlRrM

	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	PSO
CO1	3	3	3	3	2	2	3	3	3	3	3	2	3	2	3	2	2
CO2	2	3	2	3	3	3	3	3	2	3	3	3	2	3	3	3	3
CO3	3	2	3	2	3	2	3	3	2	2	3	3	2	3	3	3	3
CO4	2	3	2	3	3	3	2	3	3	2	2	3	2	3	3	2	3
CO5	2	3	3	3	2	3	2	3	2	3	2	3	2	3	2	3	2

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT210	CONVENTIONAL RADIOGRAPHIC TECHNIQUES- II	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	**3,4**
		√	√	√	√		√	√	

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT211**	**Title of the Course**	**SPECIAL RADIOGRAPHIC PROCEDURES**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn contrast-imaging techniques under the guidance of fluoroscopy, the administration of contrast media and its safety aspect.						

Course Outcomes	
CO1	Students will be able to learn about Contrast media used in Radiology and their reactions along with management.
CO2	Students will be able to learn about the barium procedures of the GIT.
CO3	Students will be able to learn about the procedures of the Urinary system and HSG.
CO4	Students will be able to learn about Nervous system and hepatobiliary procedures.
CO5	Students will be able to learn about Sialography, DCG, Sinogram, FNAC and Biopsy.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**CONTRAST MEDIA**	1. **Contrast Media-** Application, types, safety aspects & administration, Reaction to contrastmedia and management of contrast reactions.	6	CO1
2	**BARIUM PROCEDURES**	1. Barium swallow, Barium meal 2. Barium meal follow-through (BMFT) 3. Barium enema	6	CO2
3	**PROCEDURE OF URINARY & FEMALE REPRODUCTIVE SYSTEM**	1. Intravenous program (IVU). 2. Micturating Cystourethrogram (MCU). 3. Ascending Urethrogram (ASU)/RGU. 4. Hysterosalpingography (HSG).	6	CO3
4	**PROCEDURE OF NERVOUS & HEPATOBILIARY SYSTEM**	1. Myelography 2. ERCP/ PTBD 3. PTC, T–tube cholangiography	6	CO4
5	**OTHER SPECIAL PROCEDURES**	1. Sialography, 2. Dacrocystography, 3. Sinogram, 4. Fistulogram, 5. FNAC 6. Biopsy	6	CO5

Reference Books:

1. Lakhkar B N, Banavali S, Shetty C. Radiological quiz-head and neck. Indian Journal of Radiology and Imaging.
2. Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.
3. Davies SG, Chapman S. Aids to radiological differential diagnosis. Elsevier Health Sciences; 2013 Nov 20.
4. Krishnamurthy, Medical Radiographic Technique & Darkroom Practice

e-Learning Source:

1. https://youtu.be/IYfL-V2C9Uw
2. https://youtu.be/zYl2G2Z_T7M
3. https://youtu.be/JQW9RilqUaw

	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	3	2	3	2
CO2	2	3	2	3	3	3	3	3	2	3	3	3	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	2	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 & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
RT211	SPECIAL RADIOGRAPHIC PROCEDURES	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	**RT212**	**Title of the Course**	**BASICS OF USG AND MAMMOGRAPHY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn basic knowledge of ultrasound and Doppler equipment for various imaging and equipment used for breast imaging and mammography techniques.						

Course Outcomes	
CO1	Students will be able to learn about Sound and Ultrasound Imaging.
CO2	Students will be able to learn about USG equipment, Transducers and Piezoelectric crystals.
CO3	Students will be able to learn about USG Display Modes.
CO4	Students will be able to learn about Doppler USG and Mammography.
CO5	Students will be able to learn about Clinical aspects of Mammography.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO USG**	1. Sound, Ultrasound, History of ultrasound, Attenuation, Echoes, Basic principle of Ultrasound imaging, Advantages and disadvantages.	6	CO1
2	**INSTRUMENTATION OF USG**	1. Controls of Ultrasound Equipment, USG probes, Coupling agent, Cathode ray tube, Image display, USG contrast agent. 2. **Piezoelectric Effect**- Definition, Types of elements, Properties. 3. **Transducers**: Construction and operation, Types of transducers.	6	CO2
3	**USG DISPLAY MODES**	1. **USG Display modes:** A mode, B mode, M mode, TM mode. 2. **Gray scale imaging** Beam focusing, Resolution	6	CO3
4	**DOPPLER USG & MAMMOGRAPHY**	1. Principle, Doppler Effect, Colour Doppler, Continuous wave Doppler, Pulsed wave Doppler. 2. USG Bio effects. 3. **Introduction of Mammography**: Breast -radiological anatomy, Mammography Equipment and Basic views in Mammography.	6	CO4
5	**MAMMOGRAPHY TECHNIQUES**	1. Scanning protocol, Indication, Patient preparation, image quality and artifacts in Mammography, Sonomammography.	6	CO5

Reference Books:

1. Zwiebel WJ, Sohaey R. Introduction to ultrasound. WB Saunders Company;1998.
2. Hagen-Ansert SL. Textbook of diagnostic ultrasonography. Mosby Elsevier;2006.
3. Basics of Ultrasonography for Radiographers and Technologists- Latestedition
4. Tucker AK, Ng YY. Textbook of mammography. Churchill Livingstone; 2001.
5. Wentz G, Parsons WC. Mammography for radiologic technologists. McGraw-Hill,Health Professions Division; 1997

e-Learning Source:

1. https://medlineplus.gov/lab-tests/sonogram
2. https://www.radiologyinfo.org/en/info/mammo
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	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 & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
RT212	**BASICS OF USG AND MAMMOGRAPHY**	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT213**	**Title of the Course**	**BASICS OF COMPUTED TOMOGRAPHY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the pathologies.						

Course Outcomes	
CO1	Students will be able to learn about CT scan and its generations.
CO2	Students will be able to learn about instruments of CT scan.
CO3	Students will be able to learn about Image reconstruction, Image quality and CT number.
CO4	Students will be able to learn about CT artifacts.
CO5	Students will be able to learn about Clinical aspects and post processing technique of CT scan.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION AND GENERATIONS OF CT SCAN**	1. History, Advantage and Disadvantages of CT, Basic principle of CT. 2. **Generations of Computed Tomography-** 1st generation, 2nd generation, 3rd 3. generation, Slip ring technology, 4th generation, Electron beam CT, Dual Source CT,Flat Panel Detector CT Single and Multi-slice Technology.	6	CO1
2	**INSTRUMENTATION**	1. CT scanner gantry, Detectors & Data Acquisition System, Generator, Computerand image processing. 2. System Image display system, storage, recording and communication system, CTcontrol console, Options and accessories for CT systems	6	CO2
3	**IMAGE RECONSTRUCTION, DISPLAY AND QUALITY**	1. **Image Reconstruction-** Basic principle, Reconstruction algorithms, Image reconstruction from projections, Types of data reconstruction. 2. **Image Display and Image Quality** Image formation and representation, Image processing, Pixel and voxel, CT number Window level and window width, Qualities, Resolution, Contrast, Sharpness, Noise properties in CT.	6	CO3
4	**CT ARTEFACTS**	1. **CT Artefacts-** Classification, Types, Causes, Remedies	6	CO4
5	**DIAGNOSTIC ASPECTS AND POSTPROCESSING TECHNIQUES**	1. **Diagnostic aspects of CT and post Processing Techniques** HRCT, Isotropic imaging, Patient management, Patient preparation, positioning, Technologist role, Protocols for whole body imaging Clinical applications of CT, 2D & 3D imaging, MPR, SSD, Volume Rendering, BMD.	6	CO5

Reference Books:

1. Zwiebel WJ, Sohaey R. Introduction to ultrasound. WB Saunders Company;1998.
2. Hagen-Ansert SL. Textbook of diagnostic ultrasonography. Mosby Elsevier;2006.
3. Basics of Ultrasonography for Radiographers and Technologists- Latestedition
4. Tucker AK, Ng YY. Textbook of mammography. Churchill Livingstone; 2001.
5. Wentz G, Parsons WC. Mammography for radiologic technologists. McGraw-Hill,Health Professions Division; 1997

e-Learning Source:

1. https://www.slideshare.net/shreyacathe/ct-scan-62017319
2. https://www.slideshare.net/ganesahyogananthem/ct-artifact
3. **https://en.wikipedia.org/wiki/High-resolution_computed_tomography**

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 & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT213	BASICS OF COMPUTER TOMOGRAPHY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT214**	**Title of the Course**	**ORIENTATION IN CLINICAL SCIENCES-I**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn basic pathological conditions related to cardiology, surgery, nephrology, orthopedic, gastrology, neurology and general medicine for the diagnosis.						

Course Outcomes	
CO1	Students will be able to learn about disease of circular and respiratory system.
CO2	Students will be able to learn about pathological conditions of GIT.
CO3	Students will be able to learn about disease of the Urinary system.
CO4	Students will be able to learn about Pathologies of skeletal system.
CO5	Students will be able to learn about some common pathologies of human body.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**PATHOLOGY OF HEART AND RESPIRATORY**	1. Pericarditis, Valvular diseases, Rheumatic Heart Disease, Heart failure. 2. Bronchitis, Emphysema, Pneumonia, Tuberculosis, Pleura effusion, Pneumothorax.	6	CO1
2	**PATHOLOGY OF GIT**	1. Aclasia cardia, Peptic ulcer, Intestinal obstruction, Ulcerative colitis, Pancreatitis, Portal Hypertension, Ascites, Cholecystitis, Appendicitis	6	CO2
3	**PATHOLOGY OF URINARY SYSTEM**	2. Haematuria, UTI, Hydronephrosis, Horseshoe Kidney, Hydrocele, Glomerulonephritis, Urinary calculi, Polycystic Kidney disease, Renal failure	6	CO3
4	**PATHOLOGICAL CONDITIONS OFTHE SKELETAL SYSTEM**	1. Fracture, Type Mechanism, Healing, Delayed Union, Non- complication, Mal-Union 2. Injuries of the shoulder girdle, Dislocation of the shoulder 3. Dislocation of Hip 4. Fracture of Femur **5.** Acute & chronic osteoarthritis **6.** Rheumatoid arthritis, Paget's Disease, Ankylosing spondylitis, Club foot, Bone Tumour-Benign & Malignant	6	CO4
5	**OTHER PATHOLOGY**	1. Cholelithiasis, Peritonitis, Benign Hypertrophy prostate	6	CO5

Reference Books:

1. Lakhkar B N, Banavali S, Shetty C. Radiological quiz-head and neck. Indian Journal of Radiology and Imaging.
2. Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.
3. Davies SG, Chapman S. Aids to radiological differential diagnosis. Elsevier Health Sciences; 2013 Nov 20.
4. Krishnamurthy, Medical Radiographic Technique & Darkroom Practice.

e-Learning Source:

1. https://www.mayoclinic.org/diseases-conditions/hydronephrosis/cdc-20397563
2. https://medlineplus.gov/heartfailure.html
3. https://medlineplus.gov/fractures.html#:~:text=Patient%20Handouts-,Summary,cause%20weakening%20of%20the%20bones

	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 & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
RT214	ORIENTATION IN CLINICAL SCIENCES-I			√					**3,4, 11**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT215**	**Title of the Course**	**CONVENTIONAL RADIOGRAPHIC TECHNIQUES-II LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**0**	**0**	**2**	**1**
Pre-Requisite	**NIL**	**Co-requisite**	**Nil**				
Course Objectives	The main objective is to aware the student about conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with image formation, developing and reading and also handling the equipments.						

Course Outcomes	
CO1	Students will be able to learn about portable, Mobile and C-Arm machines of radiology.
CO2	Students will be able to learn about fluoroscopy.
CO3	Students will be able to learn about X-ray and fluoroscopy tables.
CO4	Students will be able to learn about tomography equipment.
CO5	Students will be able to learn about cranial and dental radiography.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**PORTABLE & MOBILE EQUIPMENT**	1. Portable & Mobile Equipment	4	CO1
2	**FLUOROSCOPY EQUIPMENT**	2. Fluoroscopy Equipment	4	CO2
3	**FLUOROSCOPIC/ RADIOGRAPHIC TABLES**	3. Fluoroscopic / Radiographic Tables	4	CO3
4	**TOMOGRAPHIC EQUIPMENT**	4. Tomographic Equipment	4	CO4
5	**CRANIAL AND DENTAL RADIOGRAPHY**	5. Equipment for Cranial and Dental Radiography 6. Dental Radiography	4	CO5

Reference Books:

1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic cardiology. Lippincott Williams & Wilkins; 1990.
2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar20.
3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.
4. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger& Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.
5. D N and M O Chesney- X ray equipments for student radiographers- Thirdedition
6. Burgener FA, Kormano M. Differential diagnosis in conventional radiology

e-Learning Source:

1. https://youtu.be/R2-GB65Wa5w
2. https://youtu.be/JDYG-JEl6kI
3. https://youtu.be/IhjbvEnlRrM

	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	3	2	3	2
CO2	2	3	2	3	3	3	3	3	2	3	3	3	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	2	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 & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT215	CONVENTIONAL RADIOGRAPHIC TECHNIQUES-II LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT216**	**Title of the Course**	**SPECIAL RADIOGRAPHIC PROCEDURES- LAB**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**IV**	0	0	2	**1**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to learn contrast-imaging techniques under the guidance of fluoroscopy, administration of contrast media and its safety aspect.						

Course Outcomes	
CO1	Students will be able to learn about Contrast media used in Radiology and their reactions along with management.
CO2	Students will be able to learn about the barium procedures of the GIT.
CO3	Students will be able to learn about the procedures of the Urinary system and HSG.
CO4	Students will be able to learn about Nervous system and hepatobiliary System.
CO5	Students will be able to learn about Sialography, DCG, Sinogram, FNAC and Biopsy procedures.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**CONTRAST MEDIA**	1. Contrast media used in Radiology.	4	CO1
2	**BARIUM PROCEDURES**	2. Demonstration of Barium Studies.	6	CO2
3	**PROCEDURE OF URINARY & FEMALE REPRODUCTIVE SYSTEM**	3. Demonstration of Procedures of Urinary System	4	CO3
4	**PROCEDURE OF NERVOUS & HEPATOBILIARY SYSTEM**	4. Demonstration of HSG, Myelography & Sialography	4	CO4
5	**OTHER SPECIAL PROCEDURES**	5. Demonstration of FNAC & Biopsy	2	CO5

Reference Books:

1. Lakhkar B N, Banavali S, Shetty C. Radiological quiz-head and neck. Indian Journal of Radiology and Imaging.
2. Snopek AM. Fundamentals of Special Radiographic Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.
3. Davies SG, Chapman S. Aids to radiological differential diagnosis. Elsevier Health Sciences; 2013 Nov 20.
4. Krishnamurthy, Medical Radiographic Technique & Darkroom Practice

e-Learning Source:

1. https://youtu.be/IYfL-V2C9Uw
2. https://youtu.be/zYl2G2Z_T7M
3. https://youtu.be/JQW9RilqUaw

	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	3	2	3	2
CO2	2	3	2	3	3	3	3	3	2	3	3	3	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	2	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 & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT216	SPECIAL RADIOGRAPHIC PROCEDURES- LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT217**	**Title of the Course**	**BASICS OF COMPUTED TOMOGRAPHY- LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	2	1
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective is to induce idea on cross sectional imaging of different anatomical area along with the pathologies.						

Course Outcomes: After the successful course completion, learners will develop the following attributes:	
CO1	Students will be able to learn about CT scan non-contrast procedures.
CO2	Students will be able to learn about patient preparation and positioning in CT scans.
CO3	Students will be able to learn about radiation protection during CT scan.
CO4	Students will be able to learn about care of patient and management during contrast CT scans.
CO5	Students will be able to learn about post procedure techniques and care of patients after contrast CT scan.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**NON-CONTRAST CT SCAN**	1. Patient preparation, patient positioning, performing all non-contrast CT procedures.	4	CO1
2	**CECT SCAN**	2. Patient preparation, patient positioning, performing all contrast computed tomography procedures.	4	CO2
3	**TRAUMA CT PROCEDURES**	3. Patient preparation, patient positioning, performing all Trauma CT procedures.	4	CO3
4	**PATIENT CARE IN CT SCAN**	4. Radiation protection and care of patient during procedures including contrast mediaManagement in CT.	4	CO4
5	**CT POST PROCESSING TECHNIQUES**	5. Various post processing techniques and evaluation of image quality and clinical findings.Post procedural care of the patient.	4	CO5

Reference Books:

1. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical.
2. Applications and Quality Control. Elsevier Health Sciences; 2015 Sep 2.
3. Seeram E. Computed tomography: physical principles and recent technical advances.
4. Journal of Medical Imaging and Radiation Sciences. 2010.
5. Kak AC, Slaney M. Principles of computerized tomographic imaging. Society for Industrial and Applied Mathematics; 2001 Jan 1.
6. Hsieh J. Computed tomography: principles, design, artifacts, and recent advances.
7. SPIE press; 2003.
8. Shaw CC, editor. Cone beam computed tomography. Taylor & Francis; 2014 Feb 14.

e-Learning Source:

1. https://www.slideshare.net/shreyacathe/ct-scan-62017319
2. https://www.slideshare.net/ganesahyogananthem/ct-artifact
3. https://en.wikipedia.org/wiki/High-resolution_computed_tomography

	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
CO1	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3
CO2	2	3	2	2	3	3	3	3	2	3	3	2	2	3	3
CO3	3	2	3	2	3	2	3	3	2	2	3	3	2	3	3
CO4	2	3	2	3	3	3	2	3	3	2	3	3	2	3	3
CO5	2	3	3	3	2	3	2	3	2	3	2	3	2	3	2

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT217	BASICS OF COMPUTED TOMOGRAPHY- LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	**3,4**
		√	√	√	√		√	√	

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	**RT218**	**Title of the Course**	**HOSPITAL POSTING**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	16	8
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective of the hospital posting is to learn about patient handling, radiation protection and procedures done in the department.						

Course Outcomes: After the successful course completion, learners will develop the 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	**CLINICAL POSTING**	Students shall be deputed to various labs of the Radiology department wherein they shall undergo practical training of handling patients, collection and processing of data, samples, radiograph, & probable diagnosis. Identification of patient's particulars based on CR number, Lab Number. Process of performing various tests in different lab, like CT labs, USG Labs, MRI Lab, X-ray lab. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.	160	CO1, CO2, CO3, CO4, CO5

Reference Books:

1. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical.
2. Applications and Quality Control. Elsevier Health Sciences; 2015 Sep 2.
3. Lakhkar B N, Banavali S, Shetty C. Radiological quiz-head and neck. Indian Journal of Radiology and Imaging.
4. 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.
7. 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:

1. https://en.wikipedia.org/wiki/High-resolution_computed_tomography
2. 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

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
RT218	HOSPITAL POSTING	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**