

STUDY & EVALUATION SCHEMES
OF
BACHELOR OF SCIENCE IN RADIOLOGICAL
IMAGING TECHNOLOGY (B. Sc.RIT)

(B. Sc. RIT- VI-SEMESTER)

[Applicable w.e.f. Academic Session 2020-21]



INTEGRAL UNIVERSITY, LUCKNOW
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**Syllabus approved by Board of Study, Faculty Board, Academic Council,
Executive Council of the Integral University, Lucknow**

INTEGRAL UNIVERSITY, LUCKNOW
INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH
DEPARTMENT OF PARAMEDICAL & HEALTH SCIENCES

STUDY & EVALUATION SCHEME
B.Sc. in RADIOLOGICAL IMAGING TECHNOLOGY (BSc.RIT)
(w.e.f. July 2020)

III -Year

VI-Semester

S. No.	Code	Name of the Subject	Periods			Credits	Evaluation Scheme				Subject Total
			L	T	P		Sessional			Exam	
							CT	TA	Total	ESE	
1.	RT308	Advance CT/MRI & USG	3	1	0	4	25	15	40	60	100
2.	RT309	Nuclear Medicine Technology & PET Scan	3	1	0	4	25	15	40	60	100
3.	RT310	Interventional Procedure & Emergency Drugs	3	1	0	4	25	15	40	60	100
4.	RT311	Research Methodology & Biostatistics	3	1	0	4	25	15	40	60	100
5.	RT312	Advance CT/MRI & USG - Lab	0	0	2	1	30	30	60	40	100
6.	RT313	Nuclear Medicine Technology & PET Scan - Lab	0	0	4	2	30	30	60	40	100
7.	RT314	Hospital Posting-Lab	0	0	12	6	30	30	60	40	100
		Total	12	04	18	25	190	150	340	360	700

L: Lecture **T:** Tutorials **P:** Practical **C:** Credit **CT:** Class Test

TA: Teacher Assessment **ESE:** End Semester Examination

Sessional Total: Class Test + Teacher Assessment

Subject Total: Sessional Total + End Semester Examination (ESE)

SUBJECT-ADVANCE CT/MRI & USG
SUBJECT CODE- RT308
(w.e.f. July 2020)

L T P
3 1 0

LEARNING OBJECTIVE- The objective is to learn about the recent advancements & new imaging modalities. Outline of advanced CT/ MRI/ USG & Doppler

UNIT I: **(8Hours)**

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.

UNIT II: **(8Hours)**

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- role of radiographer.

UNIT III: **(8Hours)**

Techniques of sonography-selection- Preparations - instructions and positioning of patient for TAS, TVS, TRUS, neck USG and extremities- biopsy procedures, assurance to patients.

UNIT V: **(8Hours)**

CT of head and neck – thorax – abdomen – pelvis – Musculo skeletal 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.

LEARNING OUTCOME- At the end of the course, student will have knowledge on: Latest upgraded hardware & software of different imaging modalities. New techniques used to achieve images for special conditions. Various post processing techniques.

SUGGESTED READINGS:

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. Wakefield RJ, D'Agostino MA. Essential Applications of Musculoskeletal Ultrasound in Rheumatology E-Book: Expert Consult Premium Edition. Elsevier Health Sciences.
6. Bowra J, McLaughlin RE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences; 2011 Oct 24.
7. Buzug TM. Computed tomography: from photon statistics to modern cone-beam CT. Springer Science & Business Media; 2008 May 20.
8. Recent Trends in medical imaging (CT, MRI and USG)
9. RSNA (Journals from Radiological Society of North America)

SUBJECT- NUCLEAR MEDICINE TECHNOLOGY & PET SCAN
SUBJECT CODE- RT309
(w.e.f. July 2020)

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3 1 0

LEARNING OBJECTIVE- The objective is to learn basic basics about the radioactivity and radioactive nuclides.

UNIT-I: (8Hours)

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.

UNIT-II: (8Hours)

Production of Radio nuclides, Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators.

UNIT-III: (8Hours)

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

UNIT-IV: (8Hours)

Equipments of NMT, Gamma camera, PET, SPECT (working principle).

UNIT-V: (8Hours)

LEARNING OUTCOME- At the end of the course, student will have knowledge on:

1. Basic principle, instrumentation and clinical application of nuclear medicine Technology.
2. Radioactive transformation
3. Production, handling & transportation of radio-nuclides.

SUGGESTED READINGS:

1. Cherry SR, Sorenson JA, Phelps ME. Physics in Nuclear Medicine E-Book. Elsevier Health Sciences; 2012 Feb 14.
2. 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.
3. Sutton, David. "A textbook of radiology and imaging." (1987).
4. Waterstram-Rich KM, Gilmore D. Nuclear Medicine and PET/CT-E-Book: Technology and Techniques. Elsevier Health Sciences; 2016 Jul 30.
5. Bailey DL, Townsend DW, Valk PE, Maisey MN. Positron emission tomography. London: Springer; 2005

SUBJECT- INTERVENTIONAL PROCEDURE & EMERGENCY DRUGS
SUBJECT CODE- RT310
(w.e.f. July 2020)

L T P
3 1 0

LEARNING OBJECTIVE- The objective is to learn about the special procedures done with the interventional approaches in radiology department with the help of radiological equipments.

UNIT-I: (8Hours)

Introduction to Interventional Radiology, Contrast media & Emergency Drugs, Need for interventional procedures, Informed consent, patient care, patient preparation, Patient monitoring, role of technologist in interventional procedure Types of contrast media, method of administration, contraindication, contrast reaction management, emergency crash cart.

UNIT-II: (8Hours)

Angiographic Equipments, Catheters & guide wires, Basics of Angiographic equipments, Single and biplane angiographic equipment, Angiographic Table, Image intensifier, Flat panel detector, electromechanical injectors, Catheters, types of catheters & guidewires , seldinger technique.

UNIT-III: (8Hours)

Digital Subtraction Angiography.
Types, Instrumentation.

UNIT-IV: (8Hours)

Sterile Techniques & Radiation Protection

Laying up a sterile trolley, sterile techniques, radiation protection for staff and patient, protective devices, monitors.

UNIT-V: (8Hours)

Interventional Procedures

Cardiac, Vascular, Nonvascular.

LEARNING OUTCOME- At the end of the course, student will have knowledge on:

1. Equipments, procedure, technique and outcome of angiography
2. Drugs, contrast media & equipments of interventional radiography
3. Sterilized techniques and radiation protections.

SUGGESTED READINGS:

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. Valji K. The Practice of Interventional Radiology, with Online Cases and Video E-Book: Expert Consult Premium Edition-Enhanced Online Features. Elsevier Health Sciences.
4. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences; 2014 Jun 16.
5. Kessel D, Robertson I. Interventional Radiology: A Survival Guide E-Book. Elsevier Health Sciences; 2016 Oct 22.

SUBJECT- RESEARCH METHODOLOGY & BIOSTATICS
SUBJECT CODE- RT311
(w.e.f. July 2020)

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LEARNING OBJECTIVE- The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

UNIT-I: (8Hours)

Research Methodology: Introduction to research methods, identifying research problem.
Ethical issues in research- Research design, Basic Concepts of Biostatistics.

UNIT-II: (8Hours)

Types of Data- Research tools and Data collection methods, Sampling methods, Developing a research proposal.

UNIT-III: (8Hours)

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.

UNIT-IV: (8Hours)

Normal Distribution, Standard deviation, Standard errors. Coefficient of Variation, t-test, Chi square test.

UNIT-V: (8Hours)

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)

SUGGESTED READINGS

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

SUBJECT- ADVANCE CT/MRI & USG - LAB
SUBJECT CODE- RT312
(w.e.f. July 2020)

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COURSE CONTENT:

1. MRI Scanners: Methods of MRI imaging methods – Head and Neck
2. Patient preparation-positioning of the patient –patient in MRI
3. Special procedures- reconstructions- 3D images
4. CT of head and neck – thorax – abdomen – pelvis – musculo skeletal system
5. Patient preparation – technique – contrast media-types, dose, injection technique; timing, sequence - image display.

SUGGESTED READINGS:

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.

SUBJECT-NUCLEAR MEDICINE TECHNOLOGY & PET SCAN- LAB
SUBJECT CODE- RT313
(w.e.f. July 2020)

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COURSE CONTENT:

1. Patient preparation, patient positioning, performing all non-contrast and contrast MRI procedures.
2. Planning of different scanning planes, parameters and their tradeoffs & patient monitoring during the procedures.
3. Various post processing techniques and evaluation of image quality and clinical findings.
4. Post procedural care of the patient.

SUGGESTED READINGS:

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. Wakefield RJ, D'Agostino MA. Essential Applications of Musculoskeletal Ultrasound in Rheumatology E-Book: Expert Consult Premium Edition. Elsevier Health Sciences.

SUBJECT- HOSPITAL POSTING- LAB
SUBJECT CODE- RT314
(w.e.f. July 2020)

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COURSE CONTENT:

1. Students shall be deputed to various labs of Radiology department wherein they shall undergo practical training of handling patients, collection and processing of investigation (X Ray, Special procedures, CT Scan, MRI, Ultrasound etc) and equipment.
2. Identification of patient's particulars based on CR number, Lab Number and transfer of Patients to different Radiology labs.
3. Process of performing various tests in different Radiology labs.
4. 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.