STUDY & EVALUATION SCHEMES

OF

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

(B. Sc. RIT- V-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 **V-Semester**

S. No.	Code	Name of the Subject	Periods			Credits	Evaluation Scheme				Subject Total
							Sessional			Exam	
			L	T	P		CT	TA	Total	ESE	
1.	RT301	Magnetic Resonance Imaging	3	1	0	4	25	15	40	60	100
2.	RT302	Hospital Practice & Care of Patient	3	1	0	4	25	15	40	60	100
3.	RT303	Orientation in Clinical Sciences	3	1	0	4	25	15	40	60	100
4.	RT304	Basic Preventive Medicine & Community Health Care	2	1	0	3	25	15	40	60	100
5.	RT305	Magnetic Resonance Imaging-Lab	0	0	2	1	30	30	60	40	100
6.	RT306	Hospital Practice & Care of Patient -Lab	0	0	4	2	30	30	60	40	100
7.	RT307	Hospital Posting-Lab	0	0	14	7	30	30	60	40	100
		Total	**11**	**04**	**20**	**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- MAGNETIC RESONANCE IMAGING
SUBJECT CODE- RT301
(w.e.f. July 2020)

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Learning Objective- The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies related to musculoskeletal, soft tissue imaging.

UNIT-I: (8Hours)

Introduction and Basic Principle of Magnetic Resonance Imaging History of MRI, Electricity & Magnetism, Laws of magnetism, Atomic structure, Motion within the atom, The Hydrogen nucleus, Precession, Larmor equation, Resonance, MR signal, Free induction decay signal, Relaxation, T1 recovery, T2 decay, Pulse timing& parameters.

UNIT-II: (8Hours)

MRI Hardware

Introduction, Permanent magnets, Electromagnets, Super conducting magnets, Fringe fields, Shim coils, Gradient coils, Radio-frequency coils, the pulse control units, Patient transportation system, Operator interface

Encoding, Data collection & Image formation

Introduction, Gradients, Slice selection, Frequency encoding, Phase encoding, Scan timing, Sampling, data space, k-space, k-space filling and fast Fourier transformation.

UNIT-III: (8Hours)

Pulse sequences

Introduction To basic pulse sequences. Spin echo sequences, Conventional spin echo, Fast spin echo, Inversion recovery, STIR, FLAIR Proton Density Imaging, Gradient echo pulse sequences Conventional gradient echo**,** The study state, SSFP**,** Coherent residual transverse magnetization**,** Incoherent residual transverse magnetization**,** Ultra- fast imaging, Advanced imaging techniques, EPI

MRI parameters & Trade offs

Introduction, Signal To Noise Ratio (SNR) & How to increase SNR, Contrast to Noise Ratio (CNR), Spatial resolution & how to increase the spatial resolution, Scan time & how to reduce time, Tradeoffs, Decision making, Volume imaging.

UNIT-IV: (8Hours)

MRI Artefacts

Introduction, Phase miss-mapping, Aliasing or wrap around, Chemical shift artefact, Chemical missregistration, Truncation artefact/Gibbs phenomenon, Motion of the patient

Magnetic susceptibility artefact, Magic angle artefact, Zipper artefact, shading artefact Cross excitation and cross talk

MRI contrast agents

UNIT-V: (8Hours)

Flow Phenomena & MRI angiography

Introduction, The mechanisms of flow, Time of flight phenomenon, Entry slice phenomenon, Intravoxel Dephasing. **Flow phenomena compensation**-Gradient moment rephrasing, Pre saturation, Even echo rephrasing, MR Angiography.

Clinical Applications, Scanning Protocols and Safety aspects

Protocols for whole body imaging , The main magnetic field, Gradient magnetic field, Radiofrequency fields, Projectiles, Implants and prostheses, Pacemakers, Medical emergencies, Patient monitoring, Monitors and devices in MRI Claustrophobia, Quenching, Safety tips, Layout planning.

Learning outcome- At the end of the course, student will have abundant knowledge on.

1. Principle , instrumentation, and application of MRI
2. MRI hardware and software
3. Imaging sequences (pulse sequences, gradient sequences, angiography)
4. Quality assurance and controls.

SUGGESTED READINGS:

1. McRobbie DW, Moore EA, Graves MJ. MRI from Picture to Proton. Cambridge university press; 2017 Apr 13.
2. Huettel SA, Song AW, McCarthy G. Functional magnetic resonance imaging. Sunderland: Sinauer Associates; 2004 Apr 1.
3. Westbrook, Catherine, and Carolyn Kaut Roth. *MRI in Practice*. John Wiley & Sons.
4. Westbrook, Catherine. *Handbook of MRI technique*. John Wiley & Sons, 2014.
5. Möller, Torsten B., and Emil Reif. *MRI parameters and positioning*. Thieme, 2010.
6. Dale BM, Brown MA, Semelka RC. MRI: basic principles and applications. John Wiley & Sons; 2015 Aug 6.

SUBJECT- HOSPITAL PRACTICE & CARE OF PATIENT
SUBJECT CODE- RT302
(w.e.f. July 2020)

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LEARNING OBJECTIVE- The objective is to learn about the assessment and handling emergencies in the department as well as the infection controls amongst self and the patient.

UNIT-I: (8Hours)

Patient care and Assessment

Taking history, Assessing current physical status, Skin temperature, colour, consciousness, Breathing, Obtaining Vital signs, Electronic Patient Monitoring.

UNIT-II: (8Hours)

Responsibilities of the Imaging Technologist- Medication administration, routes of administration, List of frequently used medications.

Patient transfer technique &Restraint technique- Preparation for transfer, wheelchair transfer, stretcher transfer, immobilization techniques

UNIT-III: (8Hours)

Handling the emergencies in Radiology

Reaction to contrast media, Oxygen administration and suction, Respiratory emergencies, Cardiac emergencies, Trauma, Shock

Patient care during Investigation- G.I. Tract, Biliary tract, Respiratory tract, Gynecology, Cardiovascular, Lymphatic system, C.N.S. etc

UNIT-IV: (8Hours)

Infection Control

Microorganism- Bacteria, Viruses, Fungi, Prions, Protozoa Cycle of Infection, Immunity, Infectious disease Transmission modes Isolation techniques, Sterilization & sterile techniques.

UNIT-V: (8Hours)

Patient Education & Communication Patient communication problems Explanation of examinations, Radiation Safety / Protection Interacting with terminally ill patient Informed Consent.

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

- Communication with patients as well as taking patient history & consents
- Handling patients in different conditions
- Sterilization techniques, medication administrations and infection controls.

SUGGESTED READINGS:

1. Ehrlich RA, Coakes DM. Patient Care in Radiography-E-Book: With an Introduction to Medical Imaging. Elsevier Health Sciences; 2016 Jan 19.
2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug 7.
3. 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.
4. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.

SUBJECT- ORIENTATION IN CLINICAL SCIENCES
SUBJECT CODE- RT303
(w.e.f. July 2020)

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LEARNING OBJECTIVE- The objective is to learn basic medical pathologies for the image interpretation and diagnosis.

UNIT-I: Brief about- **(8Hours)**

- Meningitis
- Cerebral Vascular Disorders
- Encephalitis
- Sinusitis
- Polyps
- DNS
- Otitis Media
- Tonsillitis
- CSF Rhinorea

UNIT-II: Brief about- **(8Hours)**

- Aneurysms
- Arachnoids cysts
- Alzheimer's
- Parkinson's
- Shock
- Hypertension
- Embolism
- Hemorrhage

UNIT-III: Brief about- **(8Hours)**

- Hangman's fracture
- Dishitis
- Spondylitis
- IVDP
- Scoliosis
- Pott's
- TB Spine
- Kyphosis

UNIT-IV: Brief about- **(8Hours)**

- Hematocezia
- Anemia
- Leukemia
- Epilepsy
- COPD
- Asthma
- Emphysema

UNIT- V: Brief about- **(8Hours)**

- Hepatitis
- Diabetes Mellitus
- Varicose Vein
- DVT
- Obstetrics - Diagnosis of Pregnancy

LEARNING OUTCOME- At the end of the course, student will be expert in interpreting pathologies.

SUGGESTED READINGS:

1. Das KK. Textbook of medicine, Volumes 1 and 2. Jaypee Brothers Medical Publishers
2. (P) Ltd; 2002.
3. Mercier L. Practical Orthopedics E-Book. Elsevier Health Sciences; 2008 May 16.
4. Shenoy RM. Essentials of orthopedics. Jaypee Brothers, Medical Publishers Pvt. Limited; 2015.
5. Kumar V, Abbas AK, Fausto N, Aster JC. Robbins and Cotran Pathologic Basis of Disease, Professional Edition E-Book. Elsevier Health Sciences; 2014 Aug 27.
6. Mohan H. Textbook of pathology. New Delhi: Jaypee brothers medical publishers
7. Boyd W. A Textbook of Pathology: An Introduction to Medicine. Academic Medicine.
8. Davidsohn I, Henry JB, Todd JC. Todd-Sanford clinical diagnosis by laboratory methods.

SUBJECT- BASIC PREVENTIVE MEDICINE AND COMMUNITY HEALTH CARE
SUBJECT CODE- RT304
(w.e.f. July 2020)

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LEARNING OBJECTIVE- This curriculum imparts the knowledge of various types of diseases and functioning of various Health Programmes.

UNIT- I: (8Hours)

Definition and concepts of health, important public health acts, health problems of developed and developing countries, environment and health.

Definition and concepts of epidemiology, diseases, types and use of epidemiology. Basic emergency care and first aid.

UNIT-II: (8Hours)

Epidemiology, etiology, pathogenesis and control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhoea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS.

UNIT-III: (8Hours)

National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal immunization programme etc.

Nutrition and major nutritional problems, etiology, manifestations and prevention, components of RCH care. Examination of water, food adulteration, role of regular exercise and yoga in prevention and management of various diseases.

UNIT-IV: (8Hours)

Population, problems of population growth, birth rates, death rates, fertility rates, MMR.,CPR, Approaches and methods of contraception, Reproductive and child health. Hygiene and sanitation, sanitation barriers, excreta disposal.

UNIT-V: (8Hours)

Immunization programme, various national immunization programs and vaccine schedules, Family welfare and planning, communicable and non-communicable disease,

Health planning in India including various committees, national health policy and health goals. Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA, FAO, ILO

SUGGESTED READINGS:

1. K.Parks & Sunder Lal, (2015),Textbook of Preventive Social Medicine ,3rd edition,Bhanot Publications
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications

SUBJECT-MAGNETIC RESONANCE IMAGING - LAB
SUBJECT CODE- RT305
(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. McRobbie DW, Moore EA, Graves MJ. MRI from Picture to Proton. Cambridge university press; 2017 Apr 13.
2. Huettel SA, Song AW, McCarthy G. Functional magnetic resonance imaging. Sunderland: Sinauer Associates; 2004 Apr 1.
3. Westbrook, Catherine, and Carolyn Kaut Roth. *MRI in Practice*. John Wiley & Sons.
4. Westbrook, Catherine. *Handbook of MRI technique*. John Wiley & Sons, 2014.
5. Möller, Torsten B., and Emil Reif. *MRI parameters and positioning*. Thieme, 2010.
6. Dale BM, Brown MA, Semelka RC. MRI: basic principles and applications. John Wiley & Sons; 2015 Aug 6.

SUBJECT-HOSPITAL PRACTICE & CARE OF PATIENT- LAB
SUBJECT CODE- RT306
(w.e.f. July 2020)

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COURSE CONTENT:

1. To measure Body temp, respiratory rate, pulse, blood pressure.
2. Oxygen therapy, oxygen devices.
3. Artificial respiration and resuscitation.
4. Supervision of patients undergoing special examination.
5. Administration of drugs and contrast media.
6. Aseptic and sterile procedures.
7. First aid - shock, electrical shock.

SUGGESTED READINGS:

1. Ehrlich RA, Coakes DM. Patient Care in Radiography-E-Book: With an Introduction to Medical Imaging. Elsevier Health Sciences; 2016 Jan 19.
2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug 7.
3. 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.
4. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.

SUBJECT- HOSPITAL POSTING- LAB
SUBJECT CODE- RT307
(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, and 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.