

**STUDY & EVALUATION SCHEMES**  
**OF**  
**BACHELOR OF SCIENCE IN RADIOLOGICAL**  
**IMAGING TECHNOLOGY**  
**(B.Sc. RIT- III 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**  
**BACHELOR OF SCIENCE IN RADIOLOGICAL IMAGING**  
**TECHNOLOGY (BRIT)**  
**(w.e.f. Session 2020-21)**

**II - Year**

**III - Semester**

S. No.	Code	Name of the Subject	Periods			Credits C	Evaluation Scheme				Subject Total
			L	T	P		Sessional			Exam	
						CT	TA	Total	ESE		
1.	RT201	Radiographic Positioning- Part II	2	1	0	3	40	20	60	40	100
2.	RT202	Conventional Radiographic Techniques- Part I	2	1	0	3	40	20	60	40	100
3.	RT203	Radiation Protection and Quality Assurance	2	1	0	3	40	20	60	40	100
4.	RT204	Fundamental of Microbiology -I	2	1	0	3	40	20	60	40	100
5.	RT205	Immunology & Serology -I	2	1	0	3	40	20	60	40	100
6.	ES101	Environmental Studies	2	1	0	3	40	20	60	40	100
7.	RT206	Radiographic Positioning- Part II Lab	0	0	2	1	40	20	60	40	100
8.	RT207	Conventional Radiographic Techniques- Part I -LAB	0	0	4	2	40	20	60	40	100
9.	RT208	Radiation Protection and Quality Assurance - Lab	0	0	4	2	40	20	60	40	100
10.	RT209	Fundamentals of Microbiology & Immunology-I Lab	0	0	4	2	40	20	60	40	100
<b>Total</b>			<b>12</b>	<b>06</b>	<b>14</b>	<b>25</b>	<b>400</b>	<b>200</b>	<b>600</b>	<b>400</b>	<b>1000</b>

**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: RADIOGRAPHIC POSITIONING- PART ■ SUBJECT

CODE: RT201

L T P  
2 1 0

(w.e.f. July 2020)

## LEARNING OBJECTIVE:

The objective is to learn basic and special projections for the better and delineation diagnosis of the disease conditions of different anatomical structure (Upper and Lower Extremities, Shoulder Joint, Pelvis Griddle, Whole Spine)

## UNIT-I: UPPER & LOWER EXTRIMITIES:

**Basic and special projection-** Related radiological anatomy

- a. Finger-PA, LAT, OBLIQUE- Hand-PA, LAT- Wrist joint-PA, LAT -Forearm-AP,LAT
- b. Elbow joint-AP, LAT- Humerus-AP, LAT
- c. Femur-AP, LAT- Knee joint- AP, LAT- Patella-SKYLINE VIEW-Tibia-AP,LAT-Anklejoint-AP, LAT, MORTIS VIEW- Foot –AP, LAT

## UNIT-II: SHOULDER JOINTS:

**Basic and special projections-**Related radiological anatomy

- a. Shoulder-AP,AXIAL
- b. Clavical-AP,AP AXIAL
- c. Scapula-AP,OBLIQUE,Y VIEW

## UNIT-III PELVIC GIRDLE AND PROXIMAL FEMUR:

**Basic & special projections-** Related radiological anatomy

- a. Pelvic girdle: AP pelvis, Frog lateral(modified cleaves method ), AP axial for pelvic outlet(taylor method), AP axial for pelvic inlet(modified linienfield method), Posterior oblique- acetabulum( judet method)
- b. Hip and proximal femur: AP unilateral hip, Axiolateral, inferosuperior (danelius – miller method), Unilateral frog leg( modified cleaves method), Modified axiolateral(clements-nakayama method)
- c. Sacroiliac joints: AP, posterior oblique's

## UNIT-IV: WHOLE SPINE POSITIONING

1. **Cervical spine:** Related radiological anatomy

- a. Basic views, AP open mouth (C1 and C2), AP axial, Oblique, Lateral, Erect, Trauma lateral(horizontal beam), Cervicothorasic junction (swimmers 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**

- a Projections, AP, Lateral, 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 – R and L bending
- c Spinal fusion series: AP or PA – R and L bending, Lateral – hyperextension and hyper flexion
- d Sacrum and Coccyx: AP axial sacrum, AP axial coccyx, Lateral sacrum, Lateral coccyx

## **UNIT-V: PAEDIATRIC RADIOGRAPHY**

- a. Positioning, care and radiation protection while handling babies

### **Learning outcome:**

At the end of the course, student will be expert in practicing various radiographic positioning and procedure independently and understanding the radiographic diagnosis.

### **RECOMMENDED BOOKS:**

1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in 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.

**SUBJECT: CONVENTIONAL RADIOGRAPHIC TECHNIQUES- PART I**  
**SUBJECT CODE: RT202**

(w.e.f. July 2020)

**L T P**  
**2 1 0**

**LEARNING OBJECTIVE:**

The main objective is to 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.

**UNIT-I INTRODUCTION TO RADIOLOGIC IMAGING**

Radiation, Sources of radiation, Radioactivity, Half life, Ionizing & Non-ionizing Radiation, History of x-ray 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

**UNIT-II X- RAY PRODUCTION-**

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.

**UNIT- III THE RECORDING SYSTEM:**

X-ray film construction, Emulsion, Formation of latent image, Types of film, Handling and storage of film, Construction of Intensifying screen, Luminescence, screen characteristics, Cassette construction and types, silver recovery, Film artifacts,

**UNIT-IV PROCESSING OF LATENT IMAGE-**

Manual Processing, Automatic processing, Processing sequence, wetting, developing, fixing, washing, Drying, Processing area (Dark room) Characteristic curve, Optical density, Geometry of Radiographic image- magnification, distortion, focal spot blur, Subject factors.

**UNIT- V FLUOROSCOPY-**

Introduction to fluoroscopy, Techniques of fluoroscopy, Image Intensifier, Flux gain, Brightness gain, Minification gain, Multifield image intensifier, Cathode ray tube.

**LEARNING OUTCOME:**

At the end of the course, the students will have knowledge on:

1. Generation of x-ray tube and its components.
2. Generation of an x-ray and its character.
3. Image recording system.
4. Fluoroscopy and its component.

**RECOMMENDED 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 diagnostic radiology.
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- Third edition
5. Burgener FA, Korman M. Differential diagnosis in conventional radiology.

**SUBJECT: RADIATION PROTECTION AND QUALITY ASSURANCE**  
**SUBJECT CODE: RT203**

(w.e.f. July 2020)

**L T P**  
**2 1 0**

**LEARNING OBJECTIVE:**

The objective is to learn aim, objective, philosophy and principle of radiation protection to protect oneself from biological effect of radiation and monitoring of radiation exposure.

**UNIT-I:**

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, ICRP regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding.

**UNIT-II:**

1. **Radiation monitoring:** Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area monitoring 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, work load, use factor, occupancy factor.

**UNIT III:**

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 Teleradiology and PAC related.

**UNIT IV:**

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.

## **UNIT-V:**

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.

### **LEARNING OUTCOME-:**

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

1. Radiobiology and its energy determinants
2. Quality control and assessment of equipments installed in radio department.
3. Layout planning of radiology department according to ICRP, AERB recommendation.

### **RECOMMENDED BOOKS:**

1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014 Mar12.
2. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association.1996
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; 2008 Jan8.
6. [www.AERB.com](http://www.AERB.com) (Guidelines and Details of Quality Control in Radiology).



**SUBJECT: FUNDAMENTAL OF MICROBIOLOGY - I**  
**SUBJECT CODE: RT204**

(w.e.f. July 2020)

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**LEARNING OBJECTIVE:**

This subject gives a general insight into the history, basics of microbiology and imparts knowledge about equipment used in microbiology.

**UNIT-I:**

- Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner
- Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes.

**UNIT-II:**

- Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope.
- Dark ground illumination, care of microscope and common difficulties micrometry
- Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

**UNIT-III:**

- Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls, Cell Membrane
- Structure, function and chemical composition of bacterial cell membranes
- Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation

**UNIT-IV:**

- General safety measures used in Microbiology laboratory,
- Sterilization and disinfection: Various physical methods of sterilization heat,
- UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators.
- Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal

## **UNIT-V:**

- Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants
- 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

## **LEARNING OUTCOME:**

This course makes the students to know handling of instruments and sterilization techniques.

## **RECOMMENDED BOOKS:**

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, 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. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4<sup>th</sup> edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
6. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

**SUBJECT: IMMUNOLOGY & SEROLOGY - I**  
**SUBJECT CODE: RT205**

(w.e.f. July 2020)

L T P  
2 1 0

**LEARNING OBJECTIVE:**

This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.

**UNIT-I:**

- Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immuneresponse
- Cell and organs of immune system, Phagocytosis

**UNIT-II:**

- Antigens and haptens : Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens
- Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype
- Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody

**UNIT-III:**

- Mechanism of humoral and cell mediated immune response
- Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation
- Complement system and complement fixation test

**UNIT-IV:**

- Laboratory tests for demonstration of antigen antibody reaction such as agglutination, precipitation, ELISA, RIA, Immunofluorescence

**UNIT-V:**

- Rheumatological diseases, etiology and pathogenesis and lab investigations

## **LEARNING OUTCOME:**

The students will learn scientific approaches/techniques that are used to investigate various diseases.

## **RECOMMENDED 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. 11th edition 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, Edinburgh.
6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

**SUBJECT: ENVIRONMENTAL STUDIES**  
**SUBJECT CODE: ES101**

(w.e.f. July 2020)

L	T	P
2	1	0

**LEARNING OBJECTIVE:**

The student will be made aware of our environment in general, natural resources, ecosystems, environmental pollution and social issues related to environment.

**UNIT-I INTRODUCTION TO ENVIRONMENT AND ECOSYSTEMS:**

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 Ecological Succession.

**UNIT-2 NATURAL RESOURCES:**

Energy Resources: Renewable and non renewable, Soil erosion and desertification, Deforestation, Water: Use and over exploitation, Impacts of large Dams, Case studies.

**UNIT-3 BIODIVERSITY AND CONSERVATION:**

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 Biodiversity, Ecosystem and biodiversity services.

**UNIT-4 ENVIRONMENTAL POLLUTION, POLICIES AND PRACTICES:**

Environmental pollution, Solid waste management , Ill effects of fireworks, Climate change, Ozone layer depletion, acid rain and impacts on human communities and Environment, Environmental Laws: Environment Protection Act, Wildlife protection Act, Forest conservation Act, Convention on Biological Diversity (CBD), Tribal rights, Human wildlife conflicts.

**UNIT-5 HUMAN POPULATION AND THE ENVIRONMENT:**

Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons, Environmental ethics, Environmental communication and public awareness, case studies.

## RECOMMENDED 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 473 p.
8. Hawkins R .E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.
9. Heywood, V.H. & Watson , R. T.1995.Global biodiversity Assessment .Cambridge Univ.Press 1140 p.
10. Jadhve, H. and Bhosale,V. M. 1995 Environmental protection and laws, Himalaya pub, • house,Delhi.284 p.
11. Mckinnery, M.L. and School , R. M.1996 Environmental science systems and solutions, web enhanced edition 639 p.
12. Mhaskar A.K. Matter Hazardous, Techno Science Pub (TM)
13. Miller T.G. Jr, Environmental Ecology, W. B. Saunders Co.USA,574 p. 16.
14. Odum,E.P.1997.Fundamental chemistry, Goel Pub House Meerut.
15. Survey of the Environment, The Hindu (M).
16. Sharma B.K.2001.Environmental Chemistry, Goel Pub .House Meerut.

**SUBJECT NAME: RADIOGRAPHIC POSITIONING- PART II LAB**  
**SUBJECT CODE: RT206**

(w.e.f. July 2020)

**CONTENTS:**

L	T	P
0	0	3

- a) Upper & Lower Extremities Hand
- b) Forearm Arm Thigh Leg Foot
  
- c) Shoulder Joints
- d) Basic & special projection Related radiological Pathology Basic & special positioning
  
- e) Pelvis Griddle
- f) Basic & special projection Related radiological Pathology Basic & special positioning
  
- g) Whole Spine Positioning
- h) Cervical spine Thoracic spine
- i) Lumbar spine, sacrum and coccyx
  
- j) Paediatric Radiography
- k) Special Positioning Views for all the X-Rays.

**RECOMMENDED BOOKS:**

1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in 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

**SUBJECT: CONVENTIONAL RADIOGRAPHIC TECHNIQUES-ILAB**  
**SUBJECT CODE: RT207**

(w.e.f. July 2020)

**L T P**  
**0 0 3**

**LEARNING OBJECTIVE:**

The main objective is to 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. Students must know about its practical aspects and handling procedures:

1. Introduction to Radiologic Imaging
2. Ray Production-
3. The Recording System-
4. Processing of Latent Image techniques-
5. Handling of Fluoroscopy-

**RECOMMENDED 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 diagnostic radiology.
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- Third edition
5. Burgener FA, Korman M. Differential diagnosis in conventional radiology.



**SUBJECT: RADIATION PROTECTION AND QUALITY ASSURANCE-LAB**  
**SUBJECT CODE: RT208**

(w.e.f. July 2020)

**L T P**  
**2 1 0**

**LEARNING OBJECTIVE:**

The objective is to learn aim, objective, philosophy and principle of radiation protection to protect oneself from biological effect of radiation and monitoring of radiation exposure. Students must know about its practical aspects:

1. Introduction to Radiation Protection, Units & Quantities-
2. Aim & Principle of Radiation Protection-
3. Radiation monitoring-
4. Quality Control and Assessment in Radiology-
5. Care and maintenance of diagnostic equipment-
6. Role of Radiographer in Planning, QA & Radiation Protection-

**RECOMMENDED BOOKS:**

7. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014 Mar12.
8. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association.1996
9. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences; 2016 Sep6.
10. Durrani SA, Ilic R, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. World scientific.
11. Turner JE. Atoms, radiation, and radiation protection. John Wiley & Sons; 2008 Jan8.
12. [www.AERB.com](http://www.AERB.com) (Guidelines and Details of Quality Control in Radiology).

**SUBJECT: FUNDAMENTAL OF MICROBIOLOGY & IMMUNOLOGY-LAB**  
**SUBJECT CODE: RT209**

(w.e.f. July 2020)

**L T P**  
**0 0 3**

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology.
3. Demonstration of autoclave and sterilization of glass wares.
4. Demonstration of Hot air oven and sterilization of glass wares.
5. To perform Gram staining 6. To perform Acid fast staining (Zeihl Neelsen staining)
6. To perform Indian ink staining 8. To perform Hanging drop method
7. Demonstration of capsule 10. Staining of bacterial spores.
8. To demonstrate agglutination reaction.
9. To perform RA test
10. To perform WIDAL test
11. To perform RPR test.
12. To perform CRP test.

**RECOMMENDED 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. 11th edition 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 Blackwell Publication.