Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**General Anatomy-II**	**Course Code:**	**BRP 201**	**Type: Semester**	**Practical**
Credits	**01**			**Total Sessions Hours:**	**20**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives					

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

Course Outcome (CO)	
CO1	Enumeratethe function of brain, Nervous system, motor system, blood supply of brain, anatomy of brain, cranial nerves, CSP formation and about spinal cord.
CO2	Enumerate auditory system.Demonstrate anatomy of urinary system, location of kidney.
CO3	Enumerate blood vessels of reproductive system. Enumerate hormone secretion of glands and blood supply.
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.

Session Details	**Topic**	**Hours**	**Mapped CO**
Unit 1	1. Identification and description of all anatomical structures. 2. Demonstration of dissected parts.	05	CO 1,2

Unit 2	1. Demonstration of skeleton-articulated and disarticulated.	05	CO 3

Unit 3	1. Surface anatomy: Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.	10	CO 2,3

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	2	2	2	2	3	2	3	2	2	2
CO2	2	3	2	2	2	2	3	3	2	2	2	3	2	2
CO3	2	2	3	3	3	2	3	2	3	2	2	2	3	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	1. PR Ashalatha& G Deepa 's Textbook of ANATOMY & PHYSIOLOGY by 2. B.D.Chaurasia's HUMAN ANATOMY
Reference Books	1. SampathMadhyastha'sManipal manual of anatomy for allied health sciences 2. Krishna Garg &Madhu Joshi's Practical anatomy workbook 3. Dixit's Atlas of Histology for Medical Students 4. Basic Histology: A Color Atlas & Text 5. Jana's Exam Oriented Practical Anatomy 6. Krishan's Anatomy Mnemonics

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Terminal Exam	12	1. Contains a descriptive question of 4 marks 2. Contains 4 MCQs 3. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**General Anatomy-II**	**Course Code:**	**BRT201**	**Type: Semester**	**Theory**
Credits	**03**			**Total Sessions Hours:**	**40**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives					
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Enumeratethe function of brain, Nervous system, motor system, blood supply of brain, anatomy of brain, cranial nerves, CSP formation and about spinal cord.				
CO2	Enumerate auditory system.Demonstrate anatomy of urinary system, location of kidney.				
CO3	Enumerate blood vessels of reproductive system. Enumerate hormone secretion of glands and blood supply.				
Pedagogy					
Internal Evaluation Mode					

Session Details	**Topic**	**Hours**	**Mapped CO**
Unit 1	Structure, classification, microscopy with examples. Neurons, classification with **examples. Simple reflex arc** Parts of a typical spinal nerve/Dermatome:Central nervous system - disposition, parts and functions Cerebrum, Cerebellum, Midbrain &	15	CO 1, 2

	brain stem Blood supply & anatomy of brain. Spinal cord-anatomy, blood supply, nerve pathways Pyramidal, extra pyramidal system,Thalamus, hypothalamus, Structure and features ofmeninges Ventricles of brain, CSF circulation Development of nervous system & defects.		
Unit 2	Cranial nerves - (course, distribution, functions and palsy) Sympathetic nervous system, its parts and components Parasympathetic nervous system Applied anatomy	15	CO 1,2

Unit 3	Structure and function of Visual system, Auditory system, Gustatory system, Olfactory system, Somatic sensory system.Pelvic floor, innervations Kidney, Ureter, bladder, urethra.Reproductive system of male, Reproductive system of female	10	CO 1,3

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	2	2	2	2	2	2	2	3	2	3
CO2	3	3	2	3	3	2	2	3	3	2	3	2	2	3
CO3	2	1	2	2	3	3	2	3	2	2	2	2	2	3

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	1. PR Ashalatha& G Deepa 's Textbook of ANATOMY & PHYSIOLOGY by 2. B.D.Chaurasia's HUMAN ANATOMY
Reference Books	1. SampathMadhyastha'sManipal manual of anatomy for allied health sciences 2. Krishna Garg &Madhu Joshi's Practical anatomy workbook 3. Dixit's Atlas of Histology for Medical Students 4. Basic Histology: A Color Atlas & Text 5. Jana's Exam Oriented Practical Anatomy 6. Krishan's Anatomy Mnemonics

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Terminal Exam	12	4. Contains a descriptive question of 4 marks 5. Contains 4 MCQs 6. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**GENERAL PHYSIOLOGY-II**	**Course Code:**	**BRP202**	**Type: Semester**	**Practical**
Credits	**01**			**Total Sessions Hours:**	**20**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives					
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Enumerate Physiology of kidney				
CO2	Explain Physiology of lower Urinary tract				
CO3	Label Physiology of the endocrine glands				
CO4	Enumerate Physiology of reproductive system				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				
Session Details	**Topic**			**Hours**	**Mapped CO**

Unit 1	Physiology of kidney and urine formation Glomerular filtration rate, clearance, Tubular function, Ureter, bladder, urethra	05	CO 1,2
Unit 2	Physiology of the endocrine glands - , Hormones secreted by these glands, their classifications and functions.	05	CO 2,4

Unit 3	Male -Functions of testes, pubertal changes in males, testosterone -action & regulations of secretion. Female -Functions of ovaries and uterus, pubertal changes, menstrual cycle, estrogens and progestron - action and regulation.	10	CO 3

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	2	3	3	2	2	2	3	3	3	3
CO2	2	2	2	3	2	3	2	3	3	2	3	3	2	2
CO3	2	2	2	2	2	3	3	2	3	2	2	3	2	2
CO4	3	3	2	2	2	3	2	2	2	3	3	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	1. PR Ashalatha& G Deepa'sTextbook of ANATOMY & PHYSIOLOGY 2. N Geetha 'sTextbook of physiology
Reference Books	1. C C Chatterjee's Human Physiology 2. C C Chatterjee's Practical Physiology for Paramedical Courses 3. CN Chandrashekhar'sManipal Manual of Medical Physiology 4. RK Maurya's Medical Physiology

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Terminal Exam	12	7. Contains a descriptive question of 4 marks 8. Contains 4 MCQs 9. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**GENERAL PHYSIOLOGY-II**	**Course Code:**	**BRT202**	**Type: Semester**	**Theory**
Credits	**03**			**Total Sessions Hours:**	**40**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives					
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Enumerate Physiology of kidney				
CO2	Explain Physiology of lower Urinary tract				
CO3	Label Physiology of the endocrine glands				
CO4	Enumerate Physiology of reproductive system				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				
Session Details	**Topic**			**Hours**	**Mapped CO**

Unit 1	Physiology of kidney and urine formation Glomerular filtration rate, clearance, Tubular function, Ureter, bladder, urethra	10	CO 1,2
Unit 2	Physiology of the endocrine glands - , Hormones secreted by these glands, their classifications and functions.	15	CO 3, 4

Unit 3	Male -Functions of testes, pubertal changes in males, testosterone -action & regulations of secretion. Female -Functions of ovaries and uterus, pubertal changes, menstrual cycle, estrogens and progestron - action and regulation.	15	CO 3

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	2	2	2	3	3	2	2	2
CO3	2	2	3	3	3	3	2	3	2	2	3	3	2	2
CO4	2	2	3	3	3	3	2	2	2	2	2	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	3. PR Ashalatha& G Deepa'sTextbook of ANATOMY & PHYSIOLOGY 4. N Geetha 'sTextbook of physiology
Reference Books	1. C C Chatterjee's Human Physiology 2. C C Chatterjee's Practical Physiology for Paramedical Courses 3. CN Chandrashekhar'sManipal Manual of Medical Physiology 4. RK Maurya's Medical Physiology
Para Text	**Unit 1:** **Unit 2:** **Unit 3:** **Unit4:**

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Terminal Exam	12	10. Contains a descriptive question of 4 marks 11. Contains 4 MCQs 12. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or	02	

Interaction in Class		
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**Basic physics including radiological physics**	**Course Code:**	**BRT203**	**Type: Semester**	**Theory**
Credits	**03**			**Total Sessions Hours:**	**40**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	● Core		○ Creative	○ Life Skill
Course Objectives	The purpose of this course is to provide an understanding of physical concepts and underlying various technological applications. This course also provides fundamental idea about circuit analysis, working principles of machines. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Use X-ray equipment and maintenance of equipment. Should know the Warm-up procedures of X-ray machine and cooling methods.				
CO2	To be able to know how to use X-Ray exposure switches.				
CO3	Demonstrate work flow Digital/lITV fluoroscopy equipment handling. Demonstrate Handling, care and maintenance of equipment & accessories				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				
Session Details	**Topic**			**Hours**	**Mapped CO**

Unit 1	Basic Physics: Sound -The nature and propagation of sound wave (the characteristics of sound, wave theory), speed of sound in a material medium, intensity of sound, the decibel, Interference of sound waves, beats, diffraction, Doppler's effect.	05	CO 1
Unit 2	Heat- Definition of heat, temperature, Heat capacity, specific heat capacity, Heat transferconduction, convection, radiation, thermal conductivity, equation for thermal conductivity (k), the value of k of various material of interest in radiology, thermal expansion, Newton's law of cooling, Heat radiation	05	CO 1,2

Unit 3	Applied mathematics: Proportion: Direct proportion and inverse proportion, inverse square law with relevant examples, graphical representation of parameters that obey linear and exponential law: example of linear and semilog plottin A.C. and D.C. power supply with examples, single phase and poly phase power supply, switches, fuses, circuit breakers, earthing etc. main voltage drop: causes and remedy, cables; low tension, high tension. DC circuit, Ohm's law, resistivity, series and parallel combination, EMF, Krichoffs law, heating effect of current, Ammeter, voltmeter, Galvanometer. Magnets and magnetic field, force on an electric current in a magnetic field, force on electric charge moving in a magnetic field, magnetic field due to straight wire; force between two parallel wires, Ampere's law, electromagnet and solenoids.	10	CO 3
Unit 4	Rectification and Transformers: Thermionic emission; - variation of anode current with anode voltage and filament temperature; principle of rectification, wave form of half wave and full wave current/voltage wave form; Rectifiers: Introduction, energy bands in solids, the semiconductor, p-type and n-type semiconductors, density of charge carriers and conductivity, p- n junction, p-njunction diode, p-njunction diode as rectifier (half- wave and full-wave rectifier), rectifiers relative merits and demerits; silicon, germanium diodes. Principles of transformer, Electromagnetic induction, transformer design, efficiency of transformer, source of power loss	05	CO2
Unit 5	Electromagnetic radiation: Electromagnetic radiation spectrum, common properties of electromagnetic radiation; relationship between energy, frequency, wavelength and velocity e.g. X-rays and gamma rays. Properties of X-rays and gamma rays; General properties of X-rays, velocity, frequency etc., photographic effect, photochemical effect - discolouration of salts, heating effect, biological effect; ionization of gases e.g. air.. Interaction of radiation with matter: Transmission through matter, law of exponential attenuation, half value layer, attenuation coefficients; interaction of radiation with matter, classical scattering, Compton scatter, photo electric absorption, pair	05	CO 1,2

	production; practical aspects of radiation absorption and transmission through body tissues. Measurement of X-rays: Unit of quantity of radiation exposure - definition and application of 'roentgen', unit of quantity of radiation dose - definition and application of 'rad', 'gray' and 'rem';		
Unit 6	Principle and application of ionizations chamber and ionization reader unit, film and densitometer, thermo luminescent dosimeter (TLD). X. Quality and quantity of X-rays: Specification and explanation of electron volt (eV), kilovolt (kV) and half value layer (H.V.L) as an index of penetration of the radiation. 9. Basic radiation protection: Historical development, dose equivalent limit, international recommendations and current code of practice for the protection of radiation workers and the public against ionizing radiation arising from medical and dental use; protective materials, lead - impregnated substances; building materials, lead equivalents of protective, personal monitoring; film badge, pocket dosimeter TLD badges and their uses and relative merits	10	CO 1,3

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	2	3	2	3	2	2	3	2	2	2
CO2	2	2	2	3	3	3	2	2	2	2	3	2	2	2
CO3	2	2	2	3	2	2	2	2	2	2	3	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	**1. Text book of radiology for residents and technicians-**
Reference Books	**1. S K Bhargava. Text book of Radiation physics.**

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Terminal Exam	12	13. Contains a descriptive question of 4 marks 14. Contains 4 MCQs 3. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**Basic physics including radiological physics**	**Course Code:**	**BRP203**	**Type: Semester**	**Practical**
Credits	**03**			**Total Sessions Hours:**	**60**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	The purpose of this course is to provide an understanding of physical concepts and underlying various technological applications. This course also provides fundamental idea about circuit analysis, working principles of machines. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Use X-ray equipment and maintenance of equipment. Should know the Warm-up procedures of X-ray machine and cooling methods.				
CO2	To be able to know how to use X-Ray exposure switches.				
CO3	Demonstrate work flow Digital/lITV fluoroscopy equipment handling. Demonstrate Handling, care and maintenance of equipment & accessories				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				

Session Details	**PRACTICAL**	**Hours**	**Mapped CO**
Unit 1	1. X-Ray tubes and accessories, general features. 2. Portable **X-Ray** Equipment.	20	CO 2

Unit 2	1. Image intensifier, its features, spot film. 2. Radiation protection devices 3. Effects of kV and mAs.	20	CO 1

Unit 3	1. Maintenance of X-ray equipment and accessories. 2. Mammography X-Ray tube 3. Dental X-Ray unit.	20	CO 2, 3

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	3	2	3	3	2	2	2	2	2	2
CO2	3	3	3	2	3	2	2	2	2	2	3	3	2	2
CO3	3	3	3	3	3	1	2	2	3	2	2	2	3	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	**1. Text book of radiology for residents and technicians-**
Reference Books	**1. S K Bhargava. Text book of Radiation physics.**

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Terminal Exam	12	15. Contains a descriptive question of 4 marks 16. Contains 4 MCQs 17. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**Conventional Radiography and equipment**	**Course Code:**	**BRP204**	**Type: Semester**	**Practical**
Credits	**03**			**Total Sessions Hours:**	**60**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	The purpose of this course is to provide an understanding of physical concepts and underlying various technological applications. This course also provides fundamental ideas about circuit analysis and, the working principles of machines. In addition, the course is expected to develop scientific temperament and analytical skills in students, to enable them to logically tackle complex engineering problems in their chosen area of application.				
Course Outcomes (CO): *After the successful course completion, learners will develop the following attributes:*					
Course Outcome (CO)					
CO1	Able to know the production of X-rays.				
CO2	Explain high-tension circuits, meters, and exposure timers.				
CO3	Able to know interlocking systems, control of scattered radiation				
CO4	Able to know the handling and mechanism of Fluoroscopy.				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				
Session Details	**PRACTICAL**			**Hours**	**Mapped CO**

Unit 1	Production of X-rays: X-ray tube, gas-filled X-ray tube, construction work, and limitations; stationary anode x-ray tube; construction, working, methods of cooling the anode, rating chart, and cooling chart; rotating anode x-ray tube: construction, working rating chart, speed of anode rotation, angle of anode inclination, dual focus and practical consideration in the choice of focus, anode heel effect, grid controlled x-ray tube; effect of variation of anode voltage and filament temperature; continuous and characteristics spectrum of **x** - rays, inherent filter, and added filter, their effect on the quality of the spectrum.	10	CO 1, 4
Unit 2	High tension circuits: H.T. generator for x-ray machines, three-phase rectifier circuits, three-phase six rectifier circuit, three-phase 12 rectifier circuit, high and medium frequency circuits; capacitance filter control and stabilizing equipment; mains voltage compensator, mains resistance compensator, compensation for frequency variation, control of	10	CO 1, 2

	tube voltage, kV compensator; high tension selector switch, filament circuit, control of tube current, and space charge compensation.		
Unit 3	Meters and exposure timers: Moving coil galvanometer: construction and working/conversion to millimeter, ammeter, and voltmeter, meters commonly used in diagnostic x-ray machines, pre-reading kV meter and millimeter, digital panel meters. Clockwork timers, synchronous motor timers, electronic timers, photometric timers (fluorescent and photoelectric effect as applied in timers), ion chamber-based timers, and integrated timers. 4. Interlocking circuits: Relays: description and working, use of relays in diagnostic machines for overload protection, circuit diagram; simplified circuit and block diagrams illustrating a sequence of events from the mains supply to controlled emission of x-rays.	10	C0 1
Unit 4	Control of scattered radiation: Beam limiting devices: cones, diaphragms, light beam collimator, beam centering device, methods to verify beam centering and field alignment; grids; design and control of scattered radiation, grid ratio, grid cut-off, parallel grid, focused grid, crossed grid, grided cassettes, stationary and moving grid potter bucky diaphragms, various types of grid movements; single stroke movement, oscillatory movement and reciprocatory movement.	10	CO 1, 2
Unit 5	Fluoroscopy: Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table, dark adaptation. image intensifier - Construction and working, advantages over a fluoroscopic device, principles, and methods of visualizing an intensified image, basic principles of closed circuit television camera and picture tube. Vidicon camera, CCD. Automatic brightness control, automatic exposure control, and chamber selection during fluoroscopy. Serial radiography: Manual cassette changer, rapid automatic film changer, basic principles of cine fluoroscopy and angiography use of grid controlled x-ray tube.	10	CO 2,3
Unit 6	Care and Maintenance of X-ray equipment; General care; functional tests; testing the performance of exposure timers, assessing the MA settings, testing the available KV, measurement of the focal spot of an X-ray tube, testing the light beam diaphragm, practical precautions about Brakes and locks, H.T. cables, meters and controls, tube stands and tracks as well as accessory equipment.	10	CO 4

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	3	2	2	3	3	2	2	2	2
CO2	3	2	3	2	2	3	3	2	2	3	3	2	2	2
CO3	2	2	3	2	2	3	3	2	2	3	2	3	3	2
CO4	2	2	3	3	2	2	2	3	2	2	2	2	3	3

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	**1. Text book of radiology for residents and technicians-SK Bhargava.**

Reference Books	**2. Text book of Radiation physics.**

Recapitulation & Examination Pattern		
Internal Continuous Assessment:		
Component	**Marks**	**Pattern**
Terminal Exam	12	18. Contains a descriptive question of 4 marks 19. Contains 4 MCQs 20. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**Conventional Radiography and equipment**	**Course Code:**	**BRT204**	**Type: Semester**	**Theory**
Credits	**03**			**Total Sessions Hours:**	**40**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	The purpose of this course is to provide an understanding of physical concepts and underlying various technological applications. This course also provides fundamental idea about circuit analysis, working principles of machines. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Able to know production of X-ray.				
CO2	Explain high tension circuits ,meter and exposure timers.				
CO3	Able to know interlocking systems, control of scattered radiation				
CO4	Able to know handling and mechanism of Fluoroscopy.				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				
Session Details	**Topic**			**Hours**	**Mapped CO**

Unit 1	Production of x-rays: X-ray tube, gas filled x-ray tube, construction working and limitations; stationary anode x - ray tube; construction, working, methods of cooling the anode, rating chart and cooling chart; rotating anode x - ray tube: construction, working rating chart, speed of anode rotation, angle of anode inclination, dual focus and practical consideration in choice of focus, anode heel effect, grid controlled x - ray tube; effect of variation of anode voltage and filament temperature; continuous and characteristics spectrum of **x** - rays, inherent filter and added filter, their effect on quality of the spectrum.	05	CO 1, 2
Unit 2	High tension circuits: H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit, three phase 12 rectifier circuit, high and medium frequency circuits; capacitance filter control and stabilizing equipment; mains voltage compensator, mains resistance compensator, compensation for frequency variation, control of	05	CO 1

	tube voltage, kV compensator; high tension selector switch, filament circuit, control of tube current, space charge compensation.		
Unit 3	Meters and exposure timers: Moving coil galvanometer: construction and working/conversion to millimeter, ammeter and voltmeter, meters commonly used in diagnostic x-ray machines, pre reading kV meter and millimeter, digital panel meters. Clockwork timers, synchronous motor timer, electronic timers, photo metric timers (fluorescent and photoelectric effect as applied in timers), ion chamber based timers, integrated timer. 4. Interlocking circuits: Relays: description and working, use of relays in diagnostic machines for over load protection, circuit diagram; simplified circuit and block diagrams illustrating sequence of events from mains supply to controlled emission of x-rays.	10	CO 1,3
Unit 4	Control of scattered radiation: Beam limiting devices: cones, diaphragms, light beam collimator, beam centering device, methods to verify beam centering and field alignment; grids; design and control of scattered radiation, grid ratio, grid cut-off, parallel grid, focused grid, crossed grid, grided cassettes, stationary and moving grid potter bucky diaphragms, various types of grid movements; single stroke movement, oscillatory movement and reciprocatory movement.	05	CO 1, 2
Unit 5	Fluoroscopy: Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table, dark adaptation. hnage intensifier - Construction and working, advantages over fluoroscopic device, principles and methods of visualising intensified image, basic principles of closed circuit television camera and picture tube. Vidicon camera, CCD. Automatic brightness control, automatic exposure control, chamber selection during fluoroscopy. Serial radiography: Manual cassette changer, rapid automatic film changer, basic principles of cine fluoroscopy and angiography use of grid controlled x-ray tube.	10	CO 2, 3,4
Unit 6	Care and Maintenance of X-ray equipment; General care; functional tests; testing the performance of exposure timers, assessing the MA settings, testing the available KV, measurement of focal spot of an x-ray tube, testing the light beam diaphragm, practical precautions pertaining to Brakes and locks, H.T. cables, meters and controls, tube stands and tracks as well as accessory equipment.	05	CO 3, 4

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	3	2	3	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	1	2	2	2	3	2	2	2
CO3	2	3	3	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	1	2	3	1	2	2	1	2	1	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	**1. Text book of radiology for residents and technicians-SK Bhargava.**

Reference Books	**2. Text book of Radiation physics.**

Recapitulation & Examination Pattern		
Internal Continuous Assessment:		
Component	**Marks**	**Pattern**
Terminal Exam	12	21. Contains a descriptive question of 4 marks 22. Contains 4 MCQs 23. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**Medical Ethics and Legal Aspects**	**Course Code:**	**BRT205**	**Type: Semester**	**Theory**
Credits	**03**			**Total Sessions Hours:**	**30**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This course is designed to provide the students the basic knowledge in laws and ethics to follow as health professionals. After completion of the course the students will be able to: Understand the various definitions				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	Understood the importance of the professional laws and ethics.				
CO2	Understood the legal aspects and medical ethics in health setups				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment, Practical, Presentations.				
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.				

Session Details	**Topic**	**Hours**	**Mapped CO**
Unit 1	Role, Definition and Interaction with the patients and health care professionals, Ethical, Moral, and Legal Responsibilities, Patient safety and quality, restrain policies and role of health professionals.	10	CO 1,2

	Biomedical waste Management, medical records and reports.		
Unit 2	Medical terminology- The course employs a body systems-oriented, word-analysis approach to learning medical terminology	10	CO 1

Unit 3	The goal of the class is to prepare students for the terminology they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.	10	CO 1, 2

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	2	2	2	3	2	2	2	3	3
CO2	2	2	3	2	2	3	2	2	2	3	2	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Terminal Exam	12	24. Contains a descriptive question of 4 marks 25. Contains 4 MCQs 26. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	

Department of Radiology & Imaging Techniques

Era University, Lucknow

Course Outline

Effective From: 2023-24

Name of the Program	**BRIT**			**Year/ Semester:**	**2nd**
Course Name	**Environmental Science**	**Course Code:**	**BRT206**	**Type: Semester**	**Theory**
Credits	**03**			**Total Sessions Hours:**	**30**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	The broad objectives of this course are 1. To gain an understanding of the concepts fundamental to environmental science 2. To understand the complexity of ecosystems and possibly how to sustain them 3. To understand the relationships between humans and the environment. 4. To understand major environmental problems including their causes and consequences. 5. To understand current and controversial environmental issues and possible solutions to environmental problems and their pros and cons. 6. To understand the hospital environment in general				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)					
CO1	To gain knowledge on the importance of environmental education and ecosystem.				
CO2	To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.				
CO3	To understand the treatment of wastewater and solid waste management.				
CO4	To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.				
CO5	To be aware of the national and international concern for environment for protecting the environment.				
CO6	To understand the environmental issues arising from different labs of the hospital				
Pedagogy	Explanations by the Instructor, Group/Pair Work, Discussion, Assignment,				

	Practical, Presentations.		
Internal Evaluation Mode	Terminal Exam, Attendance, Project/Assignment, Class participation, Class presentation, Bedside behavior or Interaction in class.		
Session Details	**Topic**	**Hours**	**Mapped CO**
Unit 1	Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.	04	CO 1
Unit 2	Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.	04	CO 2

Unit 3	Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity	02	CO 3 , 2
Unit 4	Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Solid waste management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies, Disaster management: Floods, earthquake, cyclone and landslides.	03	CO 1,3,4
Unit 5	From Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, water shed management Resettlement and rehabilitation of people; its pros and concerns. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation, Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness. Human Population and the Environment, Population growth, variation among nations. Population explosion-Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies.	10	CO 5
Unit 6	**Understanding the environment in the following clinical laboratories:** Microbiology, Biochemistry, Histopathology, Hematology	02	CO 5
Unit 7	Clinical Laboratory Hazards to the environment from the following and means to prevent Infectious material, Toxic Chemicals, Radioactive Material, Other miscellaneous wastes	05	CO 5, 6

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	3	2	2	2	2	1	2	1	2	2
CO2	2	3	3	2	2	2	2	2	1	2	2	2	1	1
CO3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	1	2	2	2
CO5	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO6	2	1	3	2	1	2	2	2	2	2	2	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	1. Chawla S., 2012. A Textbook of Environmental Studies, Tata Mc Graw Hill, New Delhi.
Reference Books	**Reference 1:** Jadhav, H &Bhosale, V.M., 1995. Environmental Protection and Laws. Himalaya Pub. House, New Delhi. **Reference 2:** Gadi R., Rattan, S., 2006. Environmental Studies, KATSON Books, New Delhi. **Reference** 3: Mckinney, M.L. & School, R.M., 1996. Environmental Science Systems & Solutions, Web enhanced edition. **Reference4:** Wanger K.D., 1998. Environmental Management.W.B. Saunders Co. Philadelphia, USA

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Terminal Exam	12	27. Contains a descriptive question of 4 marks 28. Contains 4 MCQs 29. Contains 2 short answer questions. Each question carries 2 marks
Attendance	04	
Project/Assignments	04	
Class participation or any other	04	
Class Presentation	04	
Bed Side Behavior or Interaction in Class	02	
Total Marks	30	