DEPARTMENT OF ALLIED HEALTH SCIENCES

Scheme & Syllabus of

Integrated B.Sc. (Hons/Hons. with Research) - M.Sc.

Medical Imaging Technology

Programme under National Education Policy 2020

(w.e.f. 2025-26 onwards)

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

(Established by State Legislature Act 17 of 1995)

'A+' GRADE NAAC Accredited

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Guru Jambheshwar University of Science and Technology
Hisar-125001, Haryana
('A+' NAAC Accredited State Govt. University)

Scheme of Examination for Integrated Five Years Programme
[UG Four Years Programme (Interdisciplinary) + PG One Year Programme)
Name of the Programme: Integrated B.Sc. (Hons/Hons with Research)-M.Sc. Medical Imaging Technology
According to National Education Policy-2020
Scheme-D
(Batch 2025-26 onwards)

Semester-I

Type of Course	Course Code	Course Title	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Exam Duration (Hrs)
Discipline Specific Course	25MIT0101T	Human Anatomy and Physiology-I	3	3	20	50	70	2.5
	25MIT0101P	Human Anatomy and Physiology-I Lab	1	2	10	20	30	3
	25MIT0102T	Radiographic Photography	4	4	30	70	100	3
	25MIT0103T	Fundamentals of Medical Imaging Technology	4	4	30	70	100	3
Minor Course/ Vocational Course	—	To be opted from the pool of MIC	2	2	15	35	50	2
Multidisciplinary Course	—	To be opted from the pool of MDC	3	3	25	50	75	2.5
Ability Enhancement Course	—	To be opted from the pool of AEC	2	2	15	35	50	2
Skill Enhancement Course	—	To be opted from the pool of SEC	3	3	25	50	75	2.5
Value Added Course	—	To be opted from the pool of VAC	2	2	15	35	50	2
Total	—	—	24	25	185	415	600	—

Semester-II

Type of Course	Course Code	Course Title	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Exam Duration (Hrs)
Discipline Specific Course	25MIT0201T	Human Anatomy and Physiology-II	3	3	20	50	70	2.5
	25MIT0201P	Human Anatomy and Physiology-II Lab	1	2	10	20	30	3
	25MIT0202T	Introduction to National Healthcare System	4	4	30	70	100	3
	25MIT0203T	Conventional Radiological Equipment	4	4	30	70	100	3
Minor Course/ Vocational Course	—	To be opted from the pool of MIC	2	2	15	35	50	2
Multidisciplinary Course	—	To be opted from the pool of MDC	3	3	25	50	75	2.5
Ability Enhancement Course	—	To be opted from the pool of AEC	2	2	15	35	50	2
Skill Enhancement Course	—	To be opted from the pool of SEC	3	3	25	50	75	2.5
Value Added Course	—	To be opted from the pool of VAC	2	2	15	35	50	2
Total	—	—	24	25	185	415	600	—

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Subject Pool Offered by the Department

Semester-II

Type of Course	Course Code	Course Title	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Exam Duration (Hrs)
Skill Enhancement Course	25SEC0201T	Medical Terminology & Record Keeping	3	3	25	50	75	2.5
Value Added Course	25VAC0110T	Patient Safety, Professionalism and Values	2	2	15	35	50	2

Note: The student opting for exit after the first year must complete an internship of 4 credits (120 Hrs) to get UG Certificate.

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Human Anatomy and Physiology – I

Course Code: 25MIT0101T Course Credits: 3 Mode: Lecture (L) Type: Compulsory Contact Hours: 3 hours per week. Examination Duration – 2.5hrs.	**Course Assessment: Max. Marks: 70 (Internal: 20; External: 50)** For the end-semester examination, the examiner is required to set seven questions in all. the first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to those six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e.12.5 marks.

Rationale

This course provides foundational knowledge of human anatomy and physiology essential for understanding the structure and function of the human body. It enables students to comprehend the interrelationship between different body systems and their role in maintaining homeostasis. This knowledge is crucial for careers in medical and allied health sciences.

Course Outcomes

After completing this course, students will be able to:

1. **CO1:** Recall the structural and functional organization of major human body systems and their interrelationships.
   (RBT Level: L1 – Remember)
2. **CO2:** Explain the mechanisms underlying physiological processes essential for body regulation and integration.
   (RBT Level: L2 – Understand)
3. **CO3:** Apply foundational anatomical and physiological concepts to interpret normal functioning of complex systems.
   (RBT Level: L3 – Apply)
4. **CO4:** Analyze the coordination among organ systems that support overall human health and homeostasis.
   (RBT Level: L4 – Analyze)
5. **CO5:** Evaluate physiological balance and deviations to understand clinical and diagnostic implications.
   (RBT Level: L5 – Evaluate)

Course Content:

Unit-1

Introduction to the Human Body: Outline of the systems of the human body, Anatomical positions, terminology, regions and planes, Structure & functions of the cell and its components, Epithelium, Tissues, Glands, Muscles.

Musculo-Skeletal System: Axial Skelton-Skull, Vertebral column, Sternum & Ribs. Appendicular Skeleton: Shoulder girdle and Bones of Upper limb pelvic girdle and Bones of lower limb. Factors affecting healing, Joints – Definition, Classification & Movements. Shoulder joint, Elbow joint, Hip joint, Knee joint. Diseases of bones and joints.

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Unit-2

Circulatory System

Cardiovascular System: Composition and functions of Blood, Erythropoiesis, Blood groups, Coagulation, Blood disorders, Cardiovascular System: Anatomy &physiology of heart and blood vessels (arteries and veins), cardiac cycle, heart valves, systemic &pulmonary circulation, Blood pressure, Cardiac output, Pulse, ECG, Heart sounds.

Lymphatic System: Lymphatic System: Lymph vessels, Lymph nodes, Functions Spleen and Thymus gland.

Unit 3

Respiratory System: Anatomy &physiology of all organs of Respiratory System, Physiology of Respiration, Exchange of gases in alveoli, O_2 Transport and CO_2 elimination, Respiratory regulation.

Reference Books:

1. Anne Waugh & Allison Grant, "Ross and Wilson Anatomy and Physiology in Health and Illness", Churchill Living Stone Elsevier, 12th Edition, 2014.
2. Arthur C Guyton, John E Hall, "Textbook of Medical Physiology", Saunders Elsevier, Pennsylvania, 13th Edition, 2015.
3. Jain A K, "Text book of Physiology", Avichal Publishing Company, Sirmour, Himachal Pradesh, 5th Edition, 2012
4. Gerard J. Tortora & Bryan H. Derrickson, "Principles of Anatomy and Physiology" Wiley, 14th Edition, 2014

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Human Anatomy and Physiology – I Lab

Course Code: 25M1T0101P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours per week Mode: Practical	**Course Assessment: Max. Marks: 30 (Internal: 10; External: 20)** For the end-semester practical examination, the assessment will be done by an external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department.

Rationale

This course provides foundational knowledge of human anatomy and physiology essential for understanding the structure and function of the human body. It enables students to comprehend the interrelationship between different body systems and their role in maintaining homeostasis. This knowledge is crucial for careers in medical and allied health sciences.

Course Outcomes

1. **CO1:** Recall anatomical structures and major organs of various human systems using models and charts.
   (RBT Level: L1 – Remember)
2. **CO2:** Explain the physiological functions of key organ systems through practical demonstrations.
   (RBT Level: L2 – Understand)
3. **CO3:** Apply experimental techniques in clinical settings.
   (RBT Level: L3 – Apply)
4. **CO4:** Analyze anatomical structures using cross-sectional imaging and correlate findings with imaging modalities.
   (RBT Level: L4 – Analyze)
5. **CO5:** Evaluate anatomical features as visualized through Ultrasound, CT, and MRI for diagnostic relevance.
   (RBT Level: L5 – Evaluate)

List of Experiments

1. Study of human skeleton parts with skeletal models.
2. Study of joints with joints models.
3. Study with charts and models of cardiovascular system.
4. Study with charts and models of respiratory system.
5. Study of Spirometry.
6. Cross sectional anatomy related to Ultrasound, CT, MRI, Imaging Techniques.

Note: At least seven experiments are to be performed by the students from the above topics. The course coordinator may also design and set experiments in addition to above topics as per the scope and requirement of the syllabus.

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Reference Books:

1. Anne Waugh & Allison Grant, "Ross and Wilson Anatomy and Physiology in Health and Illness", Churchill Living Stone Elsevier, 12th Edition, 2014.
2. Arthur C Guyton, John E Hall, "Textbook of Medical Physiology", Saunders Elsevier, Pennsylvania, 13th Edition, 2015.
3. Jain A K, "Text book of Physiology", Avichal Publishing Company, Sirmour, Himachal Pradesh, 5th Edition, 2012

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Radiographic Photography

Course Code: 25MIT0102 T Course Credits: 4 Mode: Lecture (L) Type: Compulsory Contact Hours: 4 hours per week. Examination Duration - 3hrs.	**Course Assessment: Max. Marks: 100 (Internal: 30; External: 70)** For the end-semester examination, the examiner is required to set nine questions in all. the first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to those eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks. i.e. 14 Marks.

Rationale

This course provides an in-depth understanding of radiographic imaging, film processing, and quality control measures. It emphasizes the importance of proper film handling, storage, and processing techniques to ensure high-quality diagnostic images. Knowledge of darkroom procedures, intensifying screens, and film processing methods is crucial for radiologic technologists to minimize errors and optimize image clarity.

Course Outcomes

1. **CO1:** Recall core concepts and terminology related to radiographic image acquisition and processing.
   (RBT Level: L1 – Remember)
2. **CO2:** Explain the principles, tools, and workflow involved in producing diagnostic-quality radiographic images.
   (RBT Level: L2 – Understand)
3. **CO3:** Apply standardized practices in radiographic imaging to support accuracy, safety, and reproducibility.
   (RBT Level: L3 – Apply)
4. **CO4:** Analyze the technical and procedural factors that influence the clarity, detail, and diagnostic value of radiographic outputs.
   (RBT Level: L4 – Analyze)
5. **CO5:** Evaluate imaging practices and implement quality control strategies to ensure optimal performance and patient care.
   (RBT Level: L5 – Evaluate)

Course Content:

Unit-1

The photographic process: Introduction, visible light, images produced by radiation, light sensitive photographic materials. Image Characteristic: Real and mental images, reflected, transmitted and emitted light images photographic emulsions, the photographic latent image Positive process. Film materials in X-Ray departments, history, structure of an X-ray films and single and double emulsion films, types of films, cross over effect. Spectral sensitivity of film material, graininess of film material, speed and Contrast of photographic materials. Sensitometry: Photographic density, characteristic curves, features of the characteristics curve. Variation in the characteristic curve with the development. Comparison of emulsions by their characteristic curves. Information from the characteristic curve.

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Unit-2

The storage of film material and radiograph: Storage of unprocessed films. Storing of radiographs: Expiry date, shelf life, storage condition, stock control. Intensifying screens and cassettes, Luminescence, fluorescence and phosphorescence. Construction of an intensifying screen. The Fluorescent materials: Types of intensifying screens, Intensification factor the influence of KV scattered radiation Detail sharpness and speed, size of the Crystal Reciprocity Failure, Quantum Mottle. Cassette Design; Store of Cassettes. type of cassettes, mounting of intensifying screen, Loading & Unloading of Cassettes. Care of intensifying screens, tests to check screen film contact and light leakage.

Unit-3

Film processing: Development, the nature of development – manual or automatic. The PH scale. The constitution of developing solutions both in manual and automatic processing and properties of developing chemicals. The development time, factors in the use of developer, developer activity. Fixing and role of a fixing solution. Constitution of the fixing solutions and properties of the constituents. Fixer used in automatic processors. Factors affecting the use of fixer. Regeneration of fixing solution. Silver recovery from waste fixer or from scrap film and its various methods. Rinsing washing and drying, Objects of rinsing and washing, methods. employed methods of drying films. Preparation of solutions and making stock solution. Processing equipment: Material for processing equipment, processors for manual operation, hangers, control of chemicals temperature by heating and thermostat, heaters as well as cooling methods. Maintenance of automatic processors and common faults. Dark Room: Layout and planning, Dark room construction- nature of floor, walls ceiling and radiation protection. Type of entry, door design, dark room illuminations- white light and safe lighting. Dark Room Equipment and its layout. Location of pass-through boxes or cassette hatches. Systems for day light film handling, Daylight systems using cassettes and without cassettes.

Unit-4

The radiographic image: Components in image quality –density, contrast and detail unsharpness nature in the radiographic image, various factors contributing towards unsharpness geometric photographic: Motional, mottle, Graininess distortion. The presentation of the radiograph, identification markers and Orientation Documentary preparation. Viewing accessories: Viewing boxes, magnifiers, viewing conditions. Some special imaging processes, xero-radiography its meaning technique and applications. Copying radiograph, its Techniques &application. Subtractions its techniques applied to radiography as well as its applications. Common film faults due to manufacturing well as due to chemical processing. Management of the quality of the Radiographic images and image quality control

Reference Book:

1. Philip W. Ballinger: Atlas of radiographic positioning and Radiological Procedures.
2. RA Swallow, E Naylor: Clark's positioning in Radiography. EJ Roebuck, AS Whitley
3. Sante LR: Roentgenologic technique (Edwards Inc.)
4. Goldman: A Radiographic index
5. Rossand Gailway: A Handbook of Radiography (Lewis)
6. Glenda J. Bryan: Diagnostic Radiography (Mosby)
7. Piles: Medical Radiographic Technique (Thomas)
8. Scorrow: Contrast Radiography (Schering Chemicals)

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Fundamentals of Medical Imaging Technology

Course Code: 25MIT0103T Course Credits: 4 Mode: Lecture (L) Type: Compulsory Contact Hours: 4 hours per week Examination Duration - 3hrs.	**Course Assessment: Max. Marks: 70 (Internal: 20; External: 50)** For the end-semester examination, the examiner is required to set seven questions in all. the first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to those six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e.12.5 marks.

Rationale:

The course on advanced imaging techniques aims to provide students with a comprehensive understanding of various diagnostic imaging methods that utilize ionizing and non-ionizing radiation. As the healthcare industry continues to advance with technology, it is essential for healthcare professionals, particularly in radiology and medical imaging, to be proficient in a variety of imaging techniques. This course equips students with the knowledge of X-ray-based imaging, CT scans, MRI, ultrasound, and other cutting-edge imaging technologies, thus enhancing their ability to make informed decisions for patient diagnosis and treatment. The integration of these technologies in clinical practice significantly improves patient care, diagnosis accuracy, and therapeutic interventions. The course also emphasizes the practical aspects of these imaging modalities and their clinical applications in modern healthcare settings.

Course Outcomes (CO):

1. **CO1**: Recall the foundational concepts and principles underlying various medical imaging technologies.
   (*RBT Level: L1 – Remember*)
2. **CO2**: Explain the physical and technical basis of medical imaging modalities and their role in diagnosis.
   (*RBT Level: L2 – Understand*)
3. **CO3**: Apply core imaging principles to select and perform appropriate diagnostic procedures.
   (*RBT Level: L3 – Apply*)
4. **CO4**: Analyze imaging techniques and technologies to interpret their capabilities and limitations in clinical settings.
   (*RBT Level: L4 – Analyze)*
5. **CO5**: Evaluate the safety, efficacy, and ethical considerations involved in the use of medical imaging technologies.
   (RBT Level: L5 – Evaluate)

Course Content:

Unit-1: Imaging with Ionizing Radiation

Basics of X-ray production and the operation of X-ray equipment used in medical imaging. It discusses the clinical applications of X-rays in diagnosing bone fractures, chest conditions, and abdominal problems. The unit also introduces Computerized Tomography (CT), explaining its function, operation, and use in

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diagnosing conditions like tumors and strokes. Further, Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET).

Unit-2: Magnetic Resonance Imaging (MRI)

Physics of MRI and Nuclear Magnetic Resonance (NMR), focusing on how magnetic fields and radiofrequency waves are used to generate high-resolution images. It covers the MRI instrumentation including magnets, coils, and their clinical applications, such as brain and spinal cord imaging, joint injuries, and cardiovascular diseases. Special techniques like functional MRI (fMRI) and diffusion-weighted imaging (DWI).

Unit-3: Ultrasound Imaging

Ultrasound Imaging, where high-frequency sound waves are used to create images of internal organs and tissues. It covers the propagation of ultrasound waves through various tissues and the **Doppler Effect** for assessing blood flow. The operation of **ultrasound transducers** and their clinical applications in obstetrics, cardiology, musculoskeletal imaging, and abdominal studies are discussed, highlighting its non-invasive nature and safety due to no ionizing radiation.

Unit-4: Thermal Imaging & Other Techniques

Medical Thermography, which uses infrared technology to detect temperature variations in tissues, helping to diagnose inflammation, infection, or tumors. The unit also covers **Fluoroscopy**, which uses X-rays for real-time imaging, and **Endoscopy**, where a flexible camera is used to view internal organs. The clinical uses of these techniques in procedures like GI studies, catheter insertion, and early detection of conditions are explored.

Reference Books:

1. Steve Webb, "The Physics of Medical Imaging", Taylor & Francis, New York, 2010.
2. William R Hendee, Russell Ritenour E, "Medical Imaging Physics" John Wiley, New York, 2002.
3. Paul Suetens, "Fundamentals of Medical Imaging", Cambridge University Press, 2002

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Semester-II

Type of Course	Course Code	Course Title	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Exam Duration (Hrs)
Discipline Specific Course	25MIT0201T	Human Anatomy and Physiology-II	3	3	20	50	70	2.5
	25MIT0201P	Human Anatomy and Physiology-II Lab	1	2	10	20	30	3
	25MIT0202T	Introduction to National Healthcare System	4	4	30	70	100	3
	25MIT0203T	Conventional Radiological Equipment	4	4	30	70	100	3
Minor Course/ Vocational Course	—	To be opted from the pool of MIC	2	2	15	35	50	2
Multidisciplinary Course	—	To be opted from the pool of MDC	3	3	25	50	75	2.5
Ability Enhancement Course	—	To be opted from the pool of AEC	2	2	15	35	50	2
Skill Enhancement Course	—	To be opted from the pool of SEC	3	3	25	50	75	2.5
Value Added Course	—	To be opted from the pool of VAC	2	2	15	35	50	2
Total	—	—	24	25	185	415	600	—

Note: The student opting for exit after the first year must complete an internship of 4 credits (120 Hrs) to get UG Certificate.

Subject Pool Offered by the Department

Semester-II

Type of Course	Course Code	Course Title	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Exam Duration (Hrs)
Skill Enhancement Course	25SEC0201T	Medical Terminology & Record Keeping	3	3	25	50	75	2.5
Value Added Course	25VAC0110T	Patient Safety, Professionalism and Values	2	2	15	35	50	2

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Human Anatomy and Physiology – II

Course Code: 25MIT0201T Course Credits: 3 Mode: Lecture (L) Type: Compulsory Contact Hours: 3 hours per week. Examination Duration – 2.5hrs.	**Course Assessment: Max. Marks: 70 (Internal: 20; External: 50)** For the end-semester examination, the examiner is required to set seven questions in all. the first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to those six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e.12.5 marks.

Rationale

This course provides foundational knowledge of human anatomy and physiology essential for understanding the structure and function of the human body. It enables students to comprehend the interrelationship between different body systems and their role in maintaining homeostasis. This knowledge is crucial for careers in medical and allied health sciences.

Course Outcomes

After completing this course, students will be able to:

1. **CO1**: Recall the structural and functional organization of major human body systems and their interrelationships.
   (RBT Level: L1 – Remember)
2. **CO2:** Explain the physiological processes that regulate and integrate body functions.
   (RBT Level: L2 – Understand)
3. **CO3**: Apply anatomical and physiological concepts to interpret normal body system functions.
   (RBT Level: L3 – Apply)
4. **CO4**: Analyze the coordination among different organ systems to maintain homeostasis.
   (RBT Level: L4 – Analyze)
5. **CO5**: Evaluate physiological mechanisms and their implications in health and disease.
   (RBT Level: L5 – Evaluate)

Course Content:

Unit-1

Digestive System: Digestive system: Organs of the digestive system and their secretions, functions and role in digestion. Process of digestion, enzymes and digestive juices. Nutrients, Common disorders.

Excretory System: Excretory system: Structure &functions of Nephron, Kidney, Urinary bladder, Urethra, Formation of urine, and Composition of urine, Water and electrolyte balance. Endocrine system: Structure & Functions of glands – Thyroid, Parathyroid, Pituitary, Adrenal, Pancreas.

Unit-2

Nervous System: Brain: parts & functions, Spinal Cord: parts & functions, Nerve impulse, Action potential, Reflex action, Cranial & Spinal Nerves. Autonomic nervous system (sympathetic and parasympathetic).

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Sensory System Sense organs: Eye, Physiology of sight, Ear, Physiology of hearing and balance, Structure and functions of skin.

Unit-3

Reproductive Systems: Female reproductive system: External genitalia: Location, structures and functions, Vagina, uterus, uterine tubes, ovaries, hormone control, ovulation. Breasts (Mammary glands) Changes in puberty, in pregnancy, during lactation.

Male reproductive system: Scrotum testia epididymis, seminal vesicles, Ejaculatory ducts location, structure & functions. Prostate gland & position. Functions of male reproductive system, puberty. Diseases of female and male reproductive system.

Reference Books:

1. Anne Waugh & Allison Grant, "Ross and Wilson Anatomy and Physiology in Health and Illness", Churchill Living Stone Elsevier, 12th Edition, 2014.
2. Arthur C Guyton, John E Hall, "Textbook of Medical Physiology", Saunders Elsevier, Pennsylvania, 13th Edition, 2015.
3. Jain A K, "Text book of Physiology", Avichal Publishing Company, Sirmour, Himachal Pradesh, 5th Edition, 2012
4. Gerard J. Tortora & Bryan H. Derrickson, "Principles of Anatomy and Physiology" Wiley, 14th Edition, 2014

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Human Anatomy and Physiology – II Lab

CourseCode:25MIT0201P Course Credits: 1 Type: Compulsory Contact Hours: 2 hours per week. Mode: Practical session	**Course Assessment: Max. Marks: 30(Internal: 10; External: 20)** For the end-semester practical examination, the assessment will be done by an external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department.

Rationale

This course provides foundational knowledge of human anatomy and physiology essential for understanding the structure and function of the human body. It enables students to comprehend the interrelationship between different body systems and their role in maintaining homeostasis. This knowledge is crucial for careers in medical and allied health sciences.

Course Outcomes

After completing this course, students will be able to:

1. **CO1**: Recall essential anatomical structures and physiological functions through hands-on laboratory activities.
   (RBT Level: L1 – Remember)
2. **CO2**: Explain physiological concepts and anatomical relationships using experimental observations.
   (RBT Level: L2 – Understand)
3. **CO3**: Apply practical skills to conduct experiments that demonstrate normal physiological processes.
   (RBT Level: L3 – Apply)
4. **CO4**: Analyze laboratory data to interpret the functional significance of anatomical structures.
   (RBT Level: L4 – Analyze)
5. **CO5**: Evaluate experimental results for accuracy and relevance to human physiology.
   (RBT Level: L5 – Evaluate)

List of Experiments:

1. Study with charts and models of digestive system.
2. Study with charts and models of nervous system.
3. Study with charts and models of eye, ear, nose, tongue & skin.
4. Study with charts and models of excretory system.
5. Study with charts and models of endocrine system.
6. Study with charts and models of male & female reproductive systems.
7. Cross sectional anatomy related to Ultrasound, CT, MRI, Imaging Techniques

Note: At least seven experiments are to be performed by the students from the above topics. The course coordinator may also design and set experiments in addition to above topics as per the scope and requirement of the syllabus.

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Reference Books:

1. Anne Waugh & Allison Grant, "Ross and Wilson Anatomy and Physiology in Health and Illness", Churchill Living Stone Elsevier, 12th Edition, 2014.
2. Arthur C Guyton, John E Hall, "Textbook of Medical Physiology", Saunders Elsevier, Pennsylvania, 13th Edition, 2015.
3. Jain A K, "Text book of Physiology", Avichal Publishing Company, Sirmour, Himachal Pradesh, 5th Edition, 2012
4. Gerard J. Tortora & Bryan H. Derrickson, "Principles of Anatomy and Physiology" Wiley, 14th Edition, 2014

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Introduction to National Healthcare System

Course Code: 25MIT0202T Course Credits: 4 Mode: Lecture (L) Type: Compulsory Contact Hours: 4 hours per week. Examination Duration – 3 hrs.	**Course Assessment: Max. Marks: 100 (Internal: 30; External: 70)** For the end-semester examination, the examiner is required to set nine questions in all. the first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to those eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks. i.e. 14 Marks.

Rationale

The healthcare delivery system is an essential component of any nation's well-being, ensuring the provision of quality medical services to its population. This course provides an in-depth understanding of healthcare structures, policies, epidemiology, and public health initiatives, particularly in the Indian context. It also introduces the integration of traditional systems of medicine, such as Ayurveda, Yoga, and Homeopathy, alongside modern medical approaches. Students will gain insight into health planning, statistics, and disease control strategies, which are vital for effective healthcare management.

Course Outcomes

Upon completing this course, students will be able to:

1. **CO1**: Recall the structure, components, and functions of the national healthcare system. *(RBT Level: L1 – Remember)*
2. **CO2**: Explain healthcare policies, delivery models, and organizational frameworks within the national system. *(RBT Level: L2 – Understand)*
3. **CO3**: Apply knowledge of healthcare system operations to assess healthcare delivery and management practices. *(RBT Level: L3 – Apply)*
4. **CO4**: Analyze the challenges, strengths, and reforms related to the national healthcare system. *(RBT Level: L4 – Analyze)*
5. **CO5**: Evaluate the impact of healthcare policies and programs on population health and resource allocation. *(RBT Level: L5 – Evaluate)*

Course Content:

Unit-1: Introduction to Healthcare Delivery System

- Structure of healthcare delivery in India at primary, secondary, and tertiary levels.
- Role of community participation in healthcare services.
- Comparison of health systems in developed nations.

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- The contribution of the private sector in healthcare.
- Overview of the National Health Mission.
- National Health Policy and its implications.
- Challenges in the healthcare delivery system in India.

Unit -2: National Health Programme and AYUSH System

Background, objectives, strategies, targets, operations, and achievements of National Health Programs.

- Introduction to traditional medicine systems:
  - Ayurveda
  - Yoga and Naturopathy
  - Unani
  - Siddha
  - Homeopathy
- The importance of integrating traditional and modern medicine.

Unit -3: Health Scenario in India and Vital Statistics

- Historical, current, and future health trends in India.
- Demography and its significance.
- Understanding vital statistics and their role in health planning.
- The impact of census data on health policies.

Unit -4: Epidemiology

- Basic principles of epidemiology.
- The natural history of diseases and their progression.
- Methods of conducting epidemiological research.
- Epidemiology of communicable and non-communicable diseases.
- Disease transmission, host defenses, immunization, and disease monitoring.

Reference Books

1. Park's Textbook of Preventive and Social Medicine – K. Park
2. Essentials of Community Medicine – Sunder Lal
3. Public Health and Preventive Medicine – Maxcy-Rosenau-Last
4. Textbook of Community Medicine – Mahajan & Gupta

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Conventional Radiological Equipment

Course Code: 25MIT0203T Course Credits: 4 Mode: Lecture (L) Type: Compulsory Contact Hours: 4 hours per week. Examination Duration - 3hrs.	**Course Assessment: Max. Marks: 100 (Internal: 30; External: 70)** For the end-semester examination, the examiner is required to set nine questions in all. the first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to those eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks. i.e. 14 Marks.

Rationale:

This course provides an in-depth understanding of the principles of x-ray production, high-tension circuits, scattered radiation control, and the maintenance of x-ray equipment. It covers essential topics such as x-ray tube construction, high-voltage generation, fluoroscopy, and radiographic techniques to ensure optimal image quality and patient safety. The knowledge gained from this course is critical for students pursuing careers in radiology and medical imaging.

Course Outcomes:

Upon completing this course, students will be able to:

1. **CO1**: Recall fundamental principles and components of conventional radiological equipment.
   (RBT Level: L1 – Remember)
2. **CO2**: Explain the design, operation, and maintenance of radiological equipment used in diagnostic imaging.
   (RBT Level: L2 – Understand)
3. **CO3**: Apply knowledge of equipment functions to ensure effective and safe radiographic procedures.
   (RBT Level: L3 – Apply)
4. **CO4**: Analyze performance parameters and troubleshoot common technical issues in radiological devices.
   (RBT Level: L4 – Analyze)
5. **CO5**: Evaluate safety protocols and quality control measures related to conventional radiological equipment.
   (RBT Level: L5 – Evaluate)

Course Content:

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.

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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 tube voltage, kV compensator; high tension selector switch, filament circuit, control of tube current, space charge compensation.

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.

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.

Unit-3

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.

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 fluoroscopic device, principles and methods of visualizing 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.

Unit-4

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.

Reference Books:

1. Sante LR: Roentgenologic technique (Edwards Inc.)
2. Rossand Gailway: A Handbook of Radiography (Lewis)
3. Glenda J. Bryan: Diagnostic Radiography (Mosby)
4. Piles: Medical Radiographic Technique (Thomas)
5. Scorrow: Contrast Radiography (Schering Chemicals)
6. Stephen Chapman &Richard Nakielny: A Guide to Radiological Procedures (Jaypee Brothers)
7. Text Book of Radiology for Residents and Technicians – Sathish.K.Bhargava

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SKILL ENHANCEMENT COURSE

Medical Terminology & Record Keeping

Course Code: 25SEC0201 T Course Credits: 3 Mode: Lecture (L) Type: Compulsory Contact Hours: 3 hours per week. Examination Duration – 2.5hrs.	**Course Assessment: Max. Marks: 75 (Internal: 25; External: 50)** For the end-semester examination, the examiner is required to set seven questions in all. the first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to those six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e.12.5 marks.

Rationale:

This course provides students with fundamental knowledge of medical terminology and record-keeping practices essential for effective communication and documentation in healthcare settings. Understanding medical terms and maintaining accurate records ensures efficient patient care, enhances communication among healthcare professionals, and supports legal and ethical compliance.

Course Outcomes (COs):

Upon completing this course, students will be able to:

1. **CO1:** Recall fundamental principles and conventions of medical language and healthcare documentation.
   (RBT Level: L1 – Remember)
2. **CO2:** Explain the role and importance of standardized terminology and systematic record keeping in clinical practice.
   (RBT Level: L2 – Understand)
3. **CO3:** Apply medical language and documentation standards to create accurate, clear, and effective healthcare records.
   (RBT Level: L3 – Apply)
4. **CO4:** Analyze the impact of proper record keeping on patient care, communication, and legal compliance within healthcare systems.
   (RBT Level: L4 – Analyze)
5. **CO5:** Evaluate medical documentation practices to ensure ethical, legal, and professional standards are met.
   (RBT Level: L5 – Evaluate)

Course Content:

Unit 1:

Introduction to Medical Terminology

- Definition and significance of medical terminology
- Role of medical language in clinical practice
- Standardization in healthcare communication

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Unit 2:

Structure and Usage of Medical Terms

- Components of medical terms: Prefixes, Suffixes, Root words
- Formation and interpretation of medical terms
- Commonly used abbreviations and symbols
- Terms related to major body systems

Unit 3:

Fundamentals of Medical Record-Keeping

- Purpose and importance of maintaining medical records
- Types of records: Electronic Health Records (EHR) and paper-based records
- Key principles of accurate and complete documentation

Standard Formats and Legal Aspects

- Common formats: SOAP notes, progress notes, discharge summaries
- Legal and ethical aspects of record-keeping
- Confidentiality, patient rights, and data protection laws

Reference Books:

1. Medical Terminology for Health Professions by Ann Ehrlich and Carol L. Schroeder
2. Essentials of Medical Terminology by Juanita J. Davies
3. Principles of Health Information Management by Marc Berg
4. ICD-10-CM and CPT Coding Handbook by American Medical Association

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VALUE ADDED COURSE

Patient Safety, Professionalism & Values

Course Code: 25VAC0110 T Course Credits: 2 Mode: Lecture (L) Type: Compulsory Contact Hours: 2hours per week. Examination Duration - 2hrs.	**Course Assessment: Max. Marks: 50 (Internal: 15; External: 35)** For the end-semester examination, the examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 03 marks each. In addition to this four more questions 10 marks each will be set, two questions from each unit. The students shall be required to attempt three questions in all selecting one question from each unit including compulsory Question No. 1.

Rationale:

This course provides a comprehensive understanding of quality assurance, emergency care, infection control, and professionalism in healthcare settings. The knowledge gained will help students ensure patient safety, maintain high standards of care, and develop essential skills for handling emergencies and professional interactions.

Course Outcomes:

Upon completing this course, students will be able to:

1. **CO1**: Recall foundational concepts of patient safety, healthcare professionalism, and ethical values in clinical practice.
   (RBT Level: L1 – Remember)
2. **CO2**: Explain principles and frameworks that underpin safe patient care, professional behavior, and ethical decision-making.
   (RBT Level: L2 – Understand)
3. **CO3**: Apply best practices in patient safety and professionalism to foster a culture of quality care and accountability.
   (RBT Level: L3 – Apply)
4. **CO4**: Analyze situations involving ethical dilemmas, safety risks, and professional challenges in healthcare settings.
   (RBT Level: L4 – Analyze)
5. **CO5**: Evaluate strategies and policies that promote patient safety, uphold professional standards, and strengthen ethical values.
   (RBT Level: L5 – Evaluate)

Course Content:

Unit-1

Quality assurance and management:

a. Concepts of Quality of Care
b. Quality Improvement Approaches
c. Standards and Norms
d. Quality Improvement Tools
e. Introduction to NABH guidelines

Basics of emergency care and life support skills:

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a. Vital signs and primary assessment
b. Basic emergency care – first aid and triage
c. Ventilations including use of bag-valve-masks (BVMs)
d. Choking, rescue breathing methods
e. One- and Two-rescuer CPR
f. Using an AED (Automated external defibrillator).
g. Managing an emergency including moving a patient

Unit-2

Infection prevention and control:

a. Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)]
b. Prevention & control of common healthcare associated infections,
c. Components of an effective infection control program, and
d. Guidelines (NABH and JCI) for Hospital Infection Control

Professionalism and values:

a. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
b. Personal values- ethical or moral values
c. Attitude and behavior- professional behavior, treating people equally
d. Code of conduct, professional accountability and responsibility, misconduct
e. Differences between professions and importance of team efforts
f. Cultural issues in the healthcare environment

Reference Books:

1. Handbook of Healthcare Quality & Patient Safety by Girdhar J. Gyani & Alexander Thomas.
2. Textbook of Patient Safety & Clinical Risk Management by Liam Donaldson, Walter Ricciardi, Susan Sheridan, Riccardo Tartaglia.
3. Implementing Patient Safety by Suzette Woodward.

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