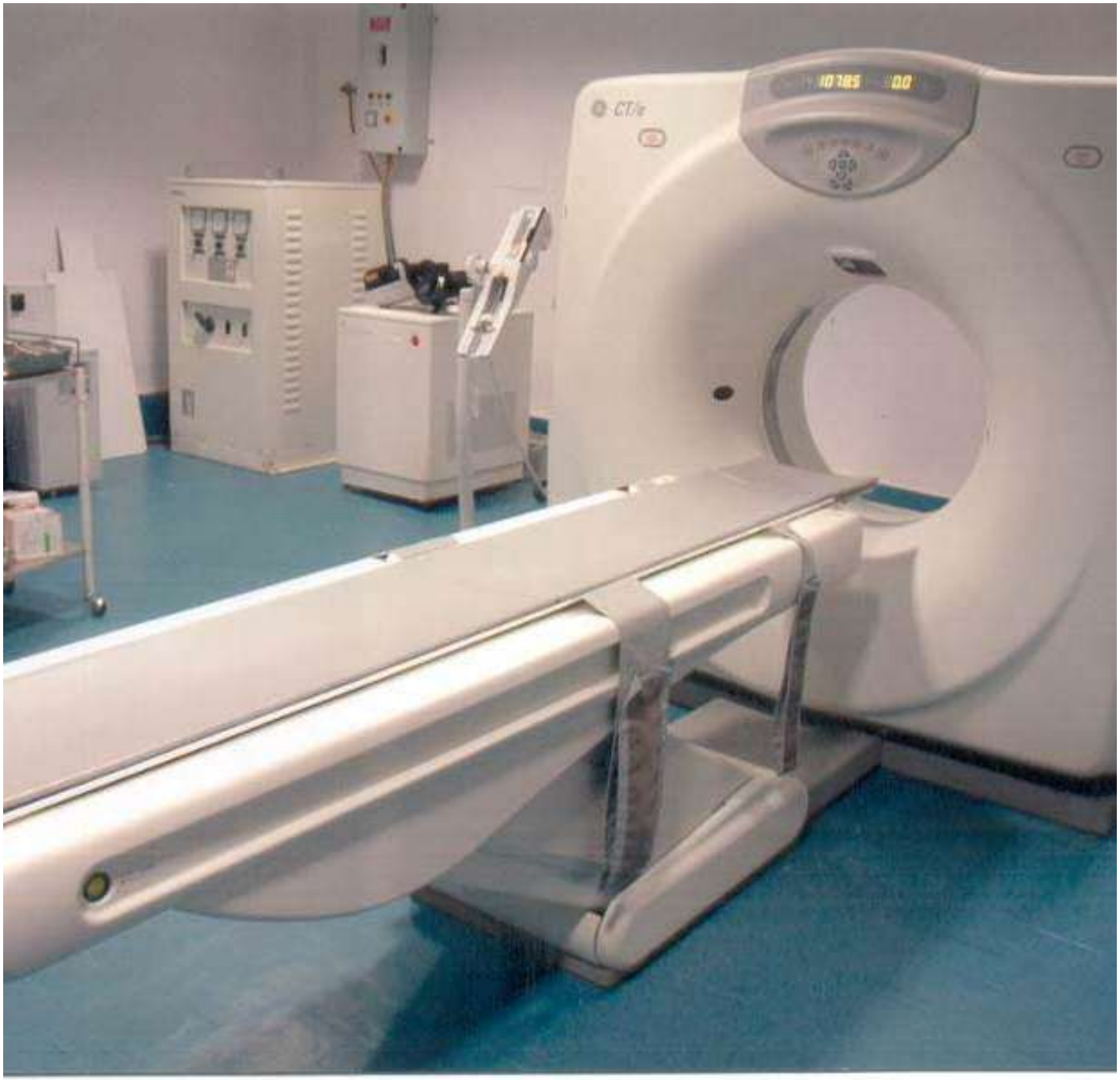
DIGITAL IMAGING EQUIPMENT

Testing and Maintenance of Biomedical Equipment

Subject Code- 28663

Course Teacher- S. M. Mayeen Hasan (Instructor)

COMPUTED TOMOGRAPHY (CT)



CT scanner

HOW IT WORKS

- Provides high-resolution cross-sectional anatomical images
- Table moves through a circular opening in the CT scanner called the gantry, while an x-ray tube emits x-rays as it spins 360 degrees inside the gantry
- A detector array measures the amount of x-rays that pass through the anatomic part and cross-sectional images are generated from data.

USES

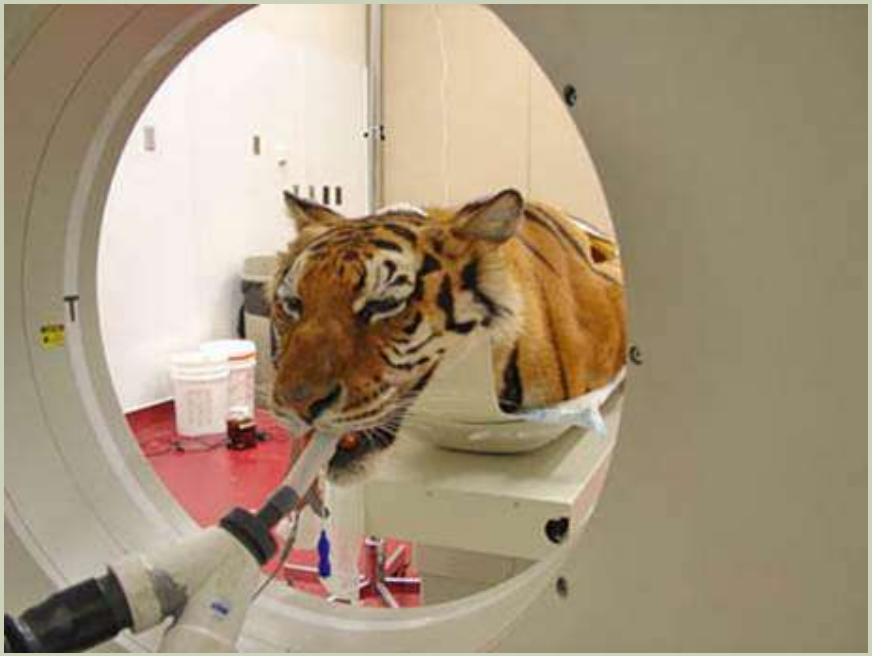
- Detects and confirms the presence of tumor
- Guides a biopsy
- Helps plan and monitor radiation and surgical treatment
- Helps diagnose problems with blood vessels and the heart
- Used for diagnosing abnormalities of the:
  - Brain, nasal passages, musculo-skeletal system, spine, abdomen, lungs and mediastinum

OTHER FACTS

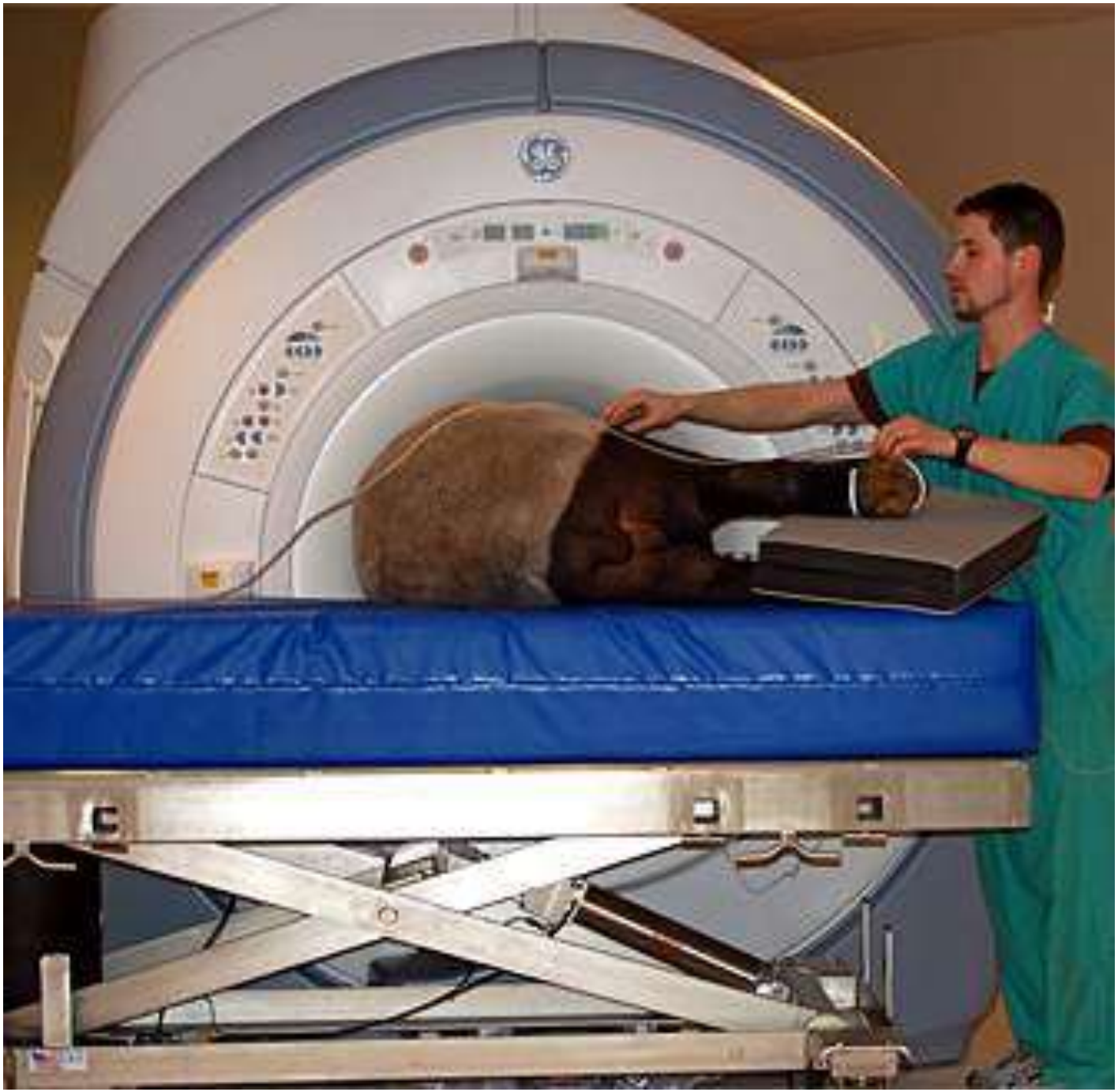
- Average scanning time per anatomic region is only 10-20 seconds therefore many patients can be examined under sedation instead of anesthesia
- General anesthesia and is necessary for thorax imaging to control respiration and for timed contrast imaging to control movement
  - Ensures the clearest and most accurate images

RISKS

- CT scans should be avoided during the first trimester of pregnancy
- Animals must be sedated or under anesthesia



MAGNETIC RESONANCE IMAGING (MRI)



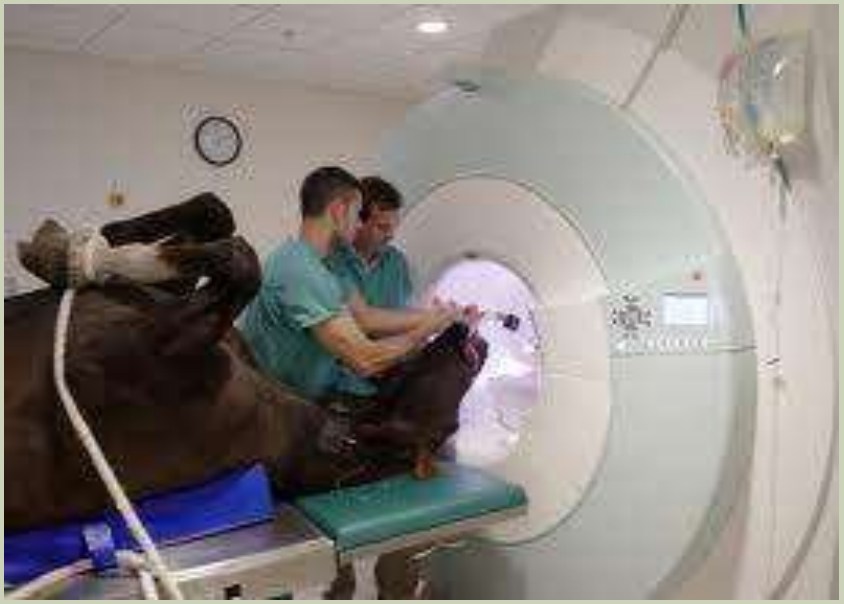
MRI Machine

HOW IT WORKS

- Uses magnetic fields and radio waves to diagnose diseases and injury of soft tissue
- The atoms comprising soft tissue align with the magnetic field in the machine
- Radio waves pulsed into the field alter the atoms causing signals to be released and transmitted to a computer
- Signals then show up as either light or dark areas in the computer image

HOW IT WORKS CONT'D.

- Primarily used to examine internal organs for abnormalities
- Imaging of large patients is limited to the limbs and head due to size constraints



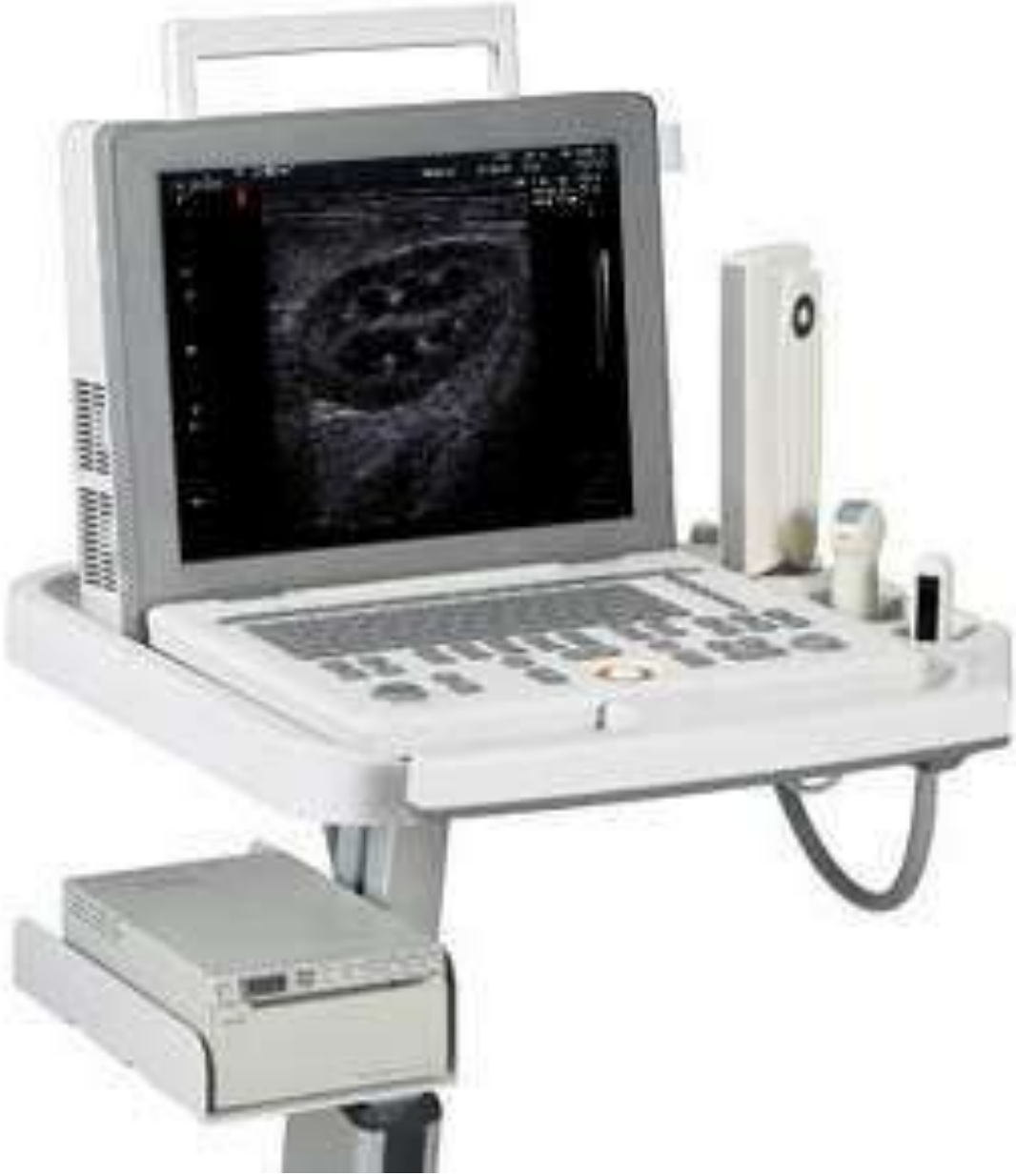
USES

- Diagnosing abnormalities of the brain, spinal cord, and musculoskeletal system
- Diagnose or monitor treatment for conditions such as:
  - Tumors of the chest, abdomen or pelvis
  - Certain types of heart disease
  - Blockages, enlargements or anatomical variants of blood vessels
  - Diseases of the gastrointestinal tract
  - Cysts and solid tumors in the kidneys or other urinary tract organs

RISKS

- Radio-frequency energy to excite molecules is similar to those from a radio or TV station
- Caution must be taken in patients with metal implants or pacemakers
- Requires general anesthesia to ensure the clearest and most accurate image possible

ULTRASOUND

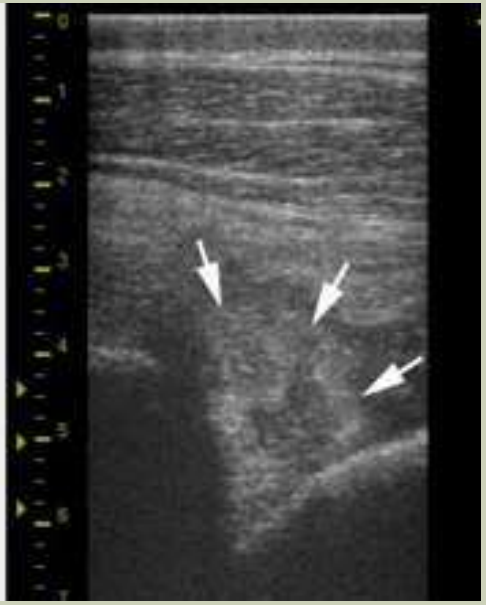


HOW IT WORKS

- Uses sound waves to produce images of organs.
- Sound waves sent into the body are reflected off of an internal tissue interface.
- Hundred of these reflected signals provide an image of the organ, which can be visualized on the ultrasound machine monitor.

USES

- Areas frequently viewed with ultrasound:
  - Thorax, abdomen, eyes, brain, and tendons
- View abnormalities of organs and provides guidance for biopsies



RISKS

- The ultrasound exam is painless, most patients require no sedation or anesthesia, and tolerate the procedure well.

Thanks for your patience.