



**CHANDIGARH  
UNIVERSITY**

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# INSTITUTE-UNIVERSITY INSTITUTE OF ENGINEERING

## ACADEMIC UNIT-II

Computer Science Engineering

Subject Name-Biology For Engineers

Subject Code- 20SZT148

**MEDICAL INSTRUMENTS**

**EEG,MRI AND XRAY**

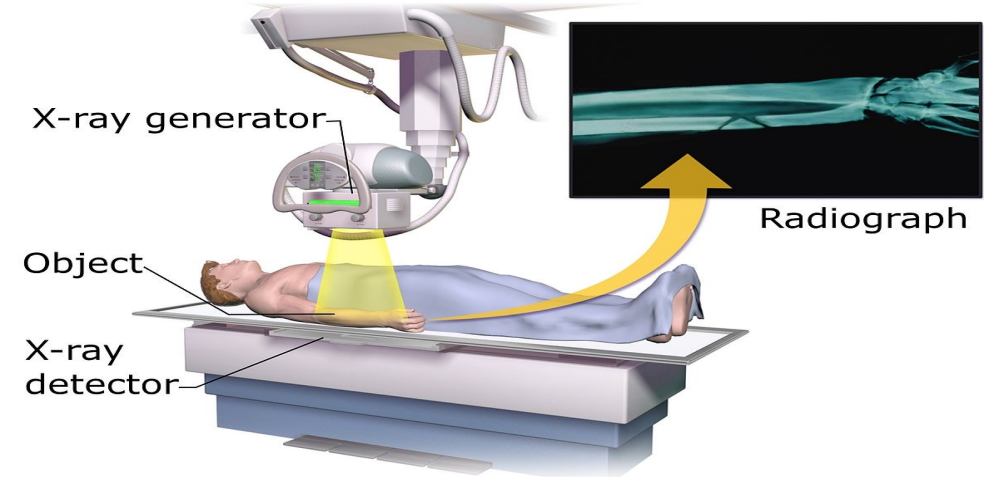
DISCOVER . **LEARN** . EMPOWER

# MEDICAL INSTRUMENTS EEG,MRI AND XRAY

## Course Outcome

CO Number	Title	Level
<b>CO1</b>	It gives an idea about the about the basic cell biology.	<b>Understanding</b>
<b>CO2</b>	It deals with the idea of uses of biology in engineering.	<b>Understanding</b>
<b>CO3</b>	It provide knowledge about the uses of softwares in biology field.	<b>Remembering</b>

### Projectional radiography

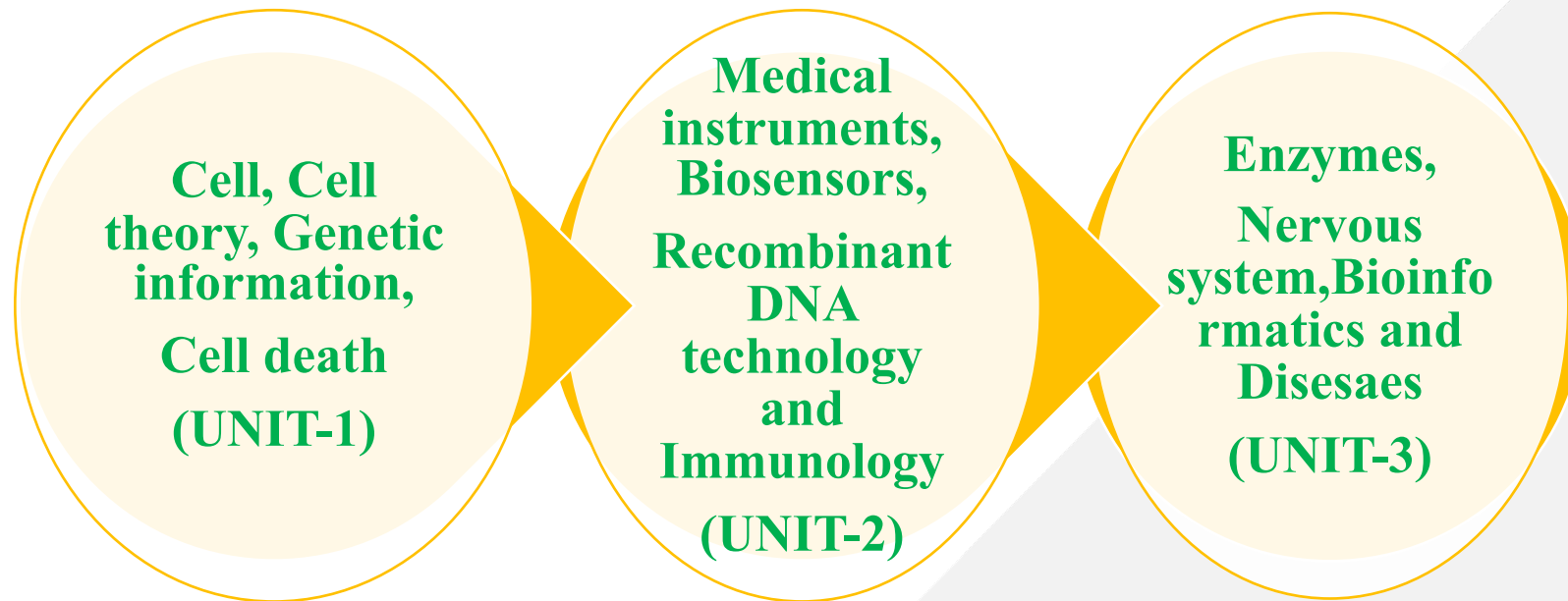


Will be covered in this  
lecture

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[https://en.wikipedia.org/wiki/X-ray\\_machine](https://en.wikipedia.org/wiki/X-ray_machine)

# BIOLOGY FOR ENGINEERS



# EEG

- An electroencephalogram (EEG) is a test used to evaluate the electrical activity in the brain.
- Brain cells communicate with each other through electrical impulses.
- An EEG can be used to help detect potential problems associated with this activity.
- An EEG tracks and records brain wave patterns.



<https://factdr.com/diagnostics/procedures/eeg-electroencephalogram/>

# WHY EEG PERFORMED

- An EEG is used to detect problems in the electrical activity of the brain that may be associated with certain brain disorders.
- seizure disorders (such as epilepsy)
- encephalitis(inflammation of the brain)
- brain tumor
- encephalopathy (disease that causes brain dysfunction)
- memory problems
- sleep disorders
- stroke
- When someone is in a coma, an EEG may be performed to determine the level of brain activity.

# EEG

- An EEG measures the electrical impulses in your brain by using several electrodes that are attached to your scalp. An electrode is a conductor through which an electric current enters or leaves. The electrodes transfer information from your brain to a machine that measures and records the data.
- Specialized technicians administer EEGs at hospitals, doctor's offices, and laboratories. The test usually takes 30 to 60 minutes to complete, and involves the following steps:
  - You'll lie down on your back in a reclining chair or on a bed.
  - The technician will measure your head and mark where to place the electrodes. These spots are scrubbed with a special cream that helps the electrodes get a high-quality reading.

# EEG

- The technician will put a sticky gel adhesive on 16 to 25 electrodes, and attach them to spots on your scalp.
- Once the test begins, the electrodes send electrical impulse data from your brain to the recording machine.
- This machine converts the electrical impulses into visual patterns that appear on a screen. A computer saves these patterns.
- The technician may instruct you to do certain things while the test is in progress. They may ask you to lie still, close your eyes, breathe deeply, or look at stimuli (such as a flashing light or a picture).

# EEG

- After the test is complete, the technician will remove the electrodes from your scalp.
- During the test, very little electricity passes between the electrodes and your skin, so you'll feel very little to no discomfort.
- In some instances, a person may undergo a 24-hour EEG. These EEGs use video to capture seizure activity.
- The EEG may show abnormalities even if the seizure does not occur during the test.
- However, it does not always show past abnormalities related to seizure.



# MRI

- Magnetic resonance imaging is a medical imaging technique used in radiology to form pictures of the anatomy and the physiological processes of the body.
- MRI uses a strong magnetic field and radio waves to create detailed images of the organs and tissues within the body.



<https://www.craimaging.com/mri-scan-near-syracuse-ny/>

# MRI

- Since its invention, doctors and researchers continue to refine MRI techniques to assist in medical procedures and research.
- The development of MRI revolutionized medicine.
- An MRI scan uses a large magnet, radio waves, and a computer to create a detailed, cross-sectional image of internal organs and structures.
- The scanner itself typically resembles a large tube with a table in the middle, allowing the patient to slide in.
- An MRI scan differs from CT scans and X-rays, as it does not use potentially harmful ionizing radiation.

# PREPARATION FOR MRI

- On arrival at the hospital, doctors may ask the patient to change into a gown. As magnets are used, it is critical that no metal objects are present in the scanner. The doctor will ask the patient to remove any metal jewellery or accessories that might interfere with the machine.
- A person will probably be unable to have an MRI if they have any metal inside their body, such as bullets, shrapnel, or other metallic foreign bodies.
- This can also include medical devices, such as cochlear implants, aneurysm clips, and pacemakers.
- Individuals who are anxious or nervous about enclosed spaces should tell their doctor. Often they can be given medication prior to the MRI to help make the procedure more comfortable.

# PREPARATION FOR MRI

- Patients will sometimes receive an injection of intravenous (IV) contrast liquid to improve the visibility of a particular tissue that is relevant to the scan.
- The radiologist, a doctor who specializes in medical images, will then talk the individual through the MRI scanning process and answer any questions they may have about the procedure.
- Once the patient has entered the scanning room, the doctor will help them onto the scanner table to lie down. Staff will ensure that they are as comfortable as possible by providing blankets or cushions.
- Earplugs or headphones will be provided to block out the loud noises of the scanner. The latter is popular with children, as they can listen to music to calm any anxiety during the procedure

# DURING MRI SCAN

- Once in the scanner, the MRI technician will communicate with the patient via the intercom to make sure that they are comfortable. They will not start the scan until the patient is ready.
- During the scan, it is vital to stay still. Any movement will disrupt the images, much like a camera trying to take a picture of a moving object.
- Loud clanging noises will come from the scanner.
- This is perfectly normal. Depending on the images, at times it may be necessary for the person to hold their breath.
- If the patient feels uncomfortable during the procedure, they can speak to the MRI technician via the intercom and request that the scan be stopped.

# DURING MRI SCAN

- An MRI scanner contains two powerful magnets. These are the most important parts of the equipment.
- The human body is largely made of water molecules, which are comprised of hydrogen and oxygen atoms. At the center of each atom lies an even smaller particle called a proton, which serves as a magnet and is sensitive to any magnetic field.
- Normally, the water molecules in the body are randomly arranged, but on entering an MRI scanner, the first magnet causes the water molecules to align in one direction, either north or south.
- The second magnetic field is then turned on and off in a series of quick pulses, causing each hydrogen atom to change its alignment when switched on and then quickly switch back to its original relaxed state when switched off.

# DURING MRI SCAN

- Passing electricity through gradient coils, which also cause the coils to vibrate, creates the magnetic field, causing a knocking sound inside the scanner.
- Although the patient cannot feel these changes, the scanner can detect them and, in conjunction with a computer, can create a detailed cross-sectional image for the radiologist.

The following are examples in which an MRI scanner would be used:

- Abnormalities of the brain and spinal cord
- Tumors, cysts, and other anomalies in various parts of the body
- Breast cancer screening for women who face a high risk of breast cancer

# USES OF MRI

- Injuries or abnormalities of the joints, such as the back and knee
- Certain types of heart problems
- Diseases of the liver and other abdominal organs
- The evaluation of pelvic pain in women, with causes including fibroids and endometriosis
- Suspected uterine anomalies in women undergoing evaluation for infertility
- This list is by no means exhaustive.
- The use of MRI technology is always expanding in scope and use.



# X-RAY



<https://www.indiamart.com/proddetail/hospital-digital-x-ray-machine-20187550248.html>

- X-rays are images that use a small doses of ionized radiation to take pictures of the inside of your body called radiographs.
- X-rays can help doctors diagnose things like:
- Broken bones
- Dislocated joints
- Arthritis
- Abdominal pain, in some instances
- Cancer

# X-RAY

- Most X-rays don't require any special preparation. The doctor may ask you to take off jewelry, eyeglasses, or any metal objects or clothing that could get in the way of the image.
- Doctors can take images while you stand up or lie down. It depends on the area of your body being examined. The X-ray tube hangs over the table. The film is in a drawer under the table.
- The machine sends a beam of radiation through your body. Your hard, dense bones block that beam, so they show up as white on the film below you. The radiation also goes through softer tissue like muscle and fat, which appear in shades of gray in the X-ray. The air in your lungs will look black in the image.

# CONCLUSION

- An EEG is a measurement of the continuous electrical activity of the brain. This is detected via small metal discs called electrodes that are positioned in standardized patterns on the scalp.
- Magnetic resonance imaging (MRI) uses a large magnet and radio waves to look at organs and structures inside your body. Health care professionals use MRI scans to diagnose a variety of conditions, from torn ligaments to tumors. MRIs are very useful for examining the brain and spinal cord.
- The most familiar use of x-rays is checking for fractures (broken bones), but x-rays are also used in other ways. For example, chest x-rays can spot pneumonia. Mammograms use x-rays to look for breast cancer. When you have an x-ray, you may wear a lead apron to protect certain parts of your body.

# ASSESSMENT PATTERN

Assessment Pattern	Total Marks
1 <sup>st</sup> Hourly Test	36
2 <sup>nd</sup> Hourly Test	36
Surprise Test	12
Assignment (3)	10
Quiz	4
End Semester Examination	60

# APPLICATIONS

- Improving quality of life is one of the main benefits of integrating new innovations into medicine. Medical technologies like minimally-invasive surgeries, better monitoring systems, and more comfortable scanning equipment are allowing patients to spend less time in recovery and more time enjoying a healthy life.
- To Improve Diagnosis and Treatment for Patients.
- To Support Remote Monitoring of Chronic Diseases.
- To Improve Patient Safety and Drug Management.
- To Facilitate Better Long Term Disease Management.
- To Decrease Costs While Improving Patient Care Outcomes.

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# THANK YOU

For queries  
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