NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

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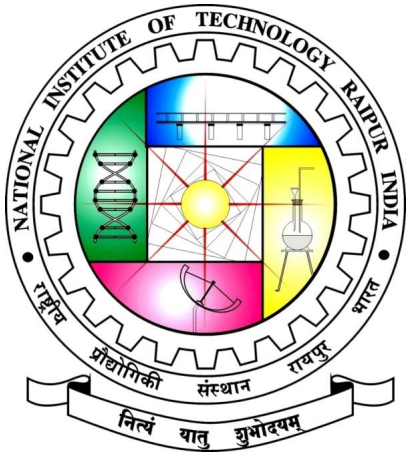

Assigement-1

FIRST SEMESTER,BIO MEDICAL ENGINEERING
under the supervision of:
Dr. Saurabh Gupta

Contents

1 Microtome

1.1 introduction

A microtome is a specialized precision cutting instrument, which accurately and repeatedly slices sections from a block of embedded tissue.The cut tissue is floated over a water bath, in order to eliminate wrinkles and distortion in the tissue, and picked up on a slide.Microtomes use steel, glass or diamond blades depending upon the specimen being sliced and the desired thickness of the sections being cut.

Figure 1: microtome

1.2 principle

The device operates using a cutting action of an infra-red laser. As the laser emits a radiation in the near infra-red, in this wavelength regime the laser can interact with biological materials.

1.3 Types of microtome

Rotary microtome

The rotary microtome is the most common instrument found in a histology laboratory.This is to reduce vibration during microtomy a microtome in which the object to be cut moves vertically downward against the knife

Base sledge microtome

Sliding or Base Sledge Microtome. This is a large heavy instrument with a fixed knife beneath which the object moves mounted on a heavy sliding base containing the feed mechanism used primarily for cutting the sections of cellulose nitrate embedded tissues with an obliquely set knife.

Figure 2: Base sledge microtome

Sliding microtome

a microtome in which the object to be cut is fixed and the knife is carried obliquely across it.

Ultra microtome

Ultramicrotomy is mainly used as a sample preparation method for transmission electron microscopy . It permits the internal fine structures of samples

Figure 3: sliding microtome

to be visualized and analyzed at nanometer scale resolution. It produces ultrathin sections of samples in a fast and clean manner.

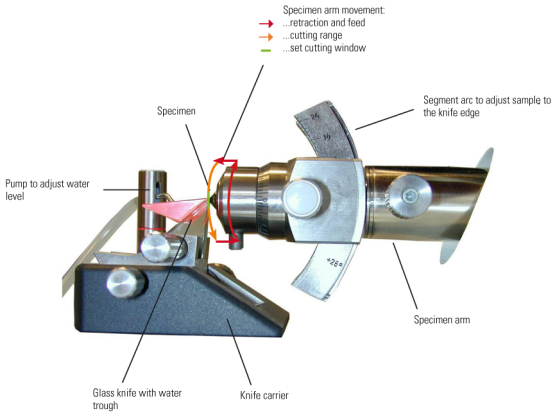

Figure 4: ultra microtome

2 Computed Radiography

2.1 Introduction

Computed radiography, or CR, is a digital image acquisition and processing system

for radiography that uses computers and laser technology. It was developed in the mid-1980s. CR images can
be recorded on laser-printed film or transmitted and stored digitally. This technological change has a significant impact on hospital operating costs and efficiency because radiography is the most common method of diagnostic imaging.

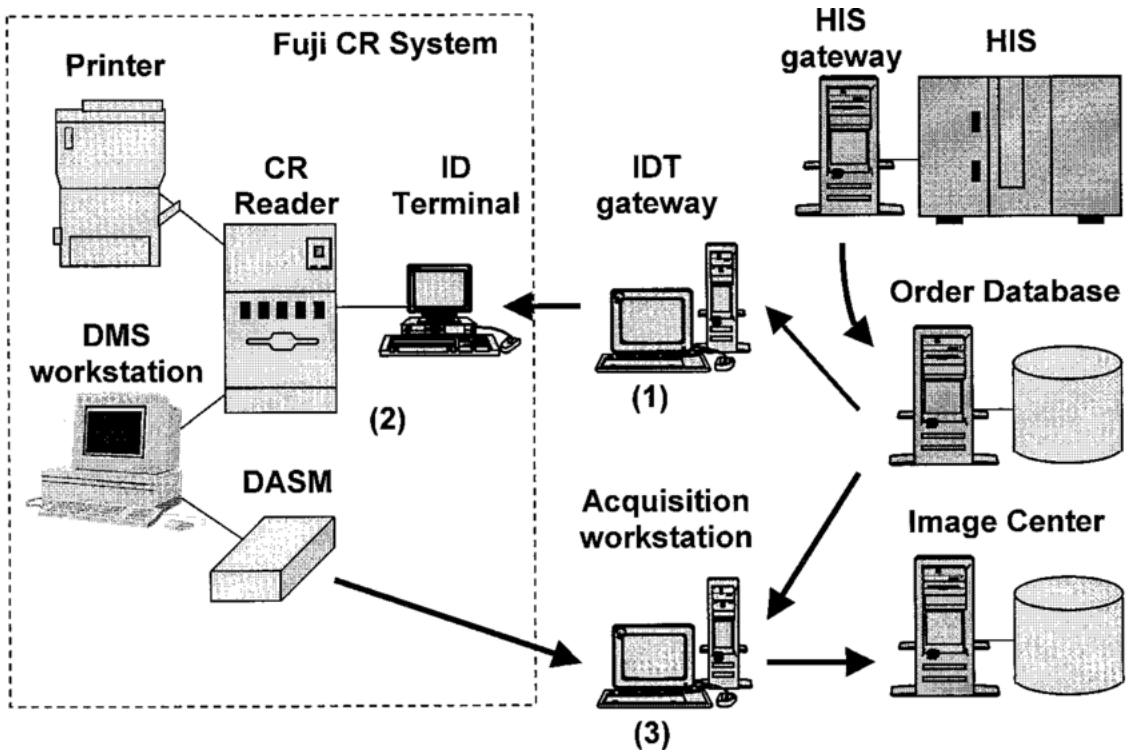

Figure 5: computed radiography

2.2 principle

In computed radiography, when imaging plates are exposed to X-rays or gamma rays, the energy of the incoming radiation is stored in a special phosphor layer. A specialized machine known as a scanner is then used to read out the latent image from the plate by stimulating it with a very finely focused laser beam.
CR uses a storage phosphor that requires light input to release the trapped energy in the form of light that is proportional to the X-ray intensity. It is referred to as a photostimulable phosphor.

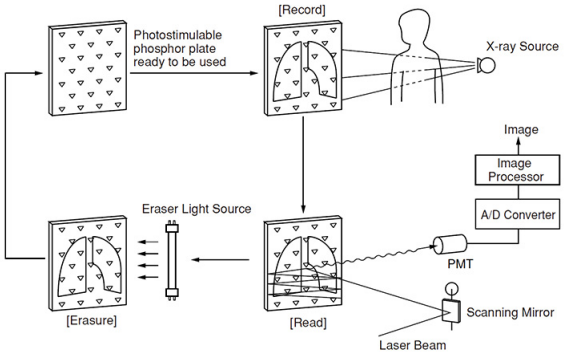

Figure 6: computed radiography principle

3 3D printing

3.1 introduction

3D Printing is a process for making a physical object from a three-dimensional digital mode.3D printing, also known as additive manufacturing.It is a method of creating a three dimensional object layer-by-layer using a computer created design.
The first documented iterations of 3D printing can be traced back to the early 1980s in Japan

3.2 How Does It Work Exactly?

All 3D printing techniques are based on the same principle: a 3D printer takes a digital model (as input) and turns it into a physical three-dimensional object by adding material layer by layer.

It is way different than traditional manufacturing processes such as injection molding and CNC machining that uses various cutting tools to construct the desired structure from a solid block.

3.3 what is use of 3D ?

1. industry field:- for making various type of objects
2. medical field:- Disigning atrificial organes and other thing
3. jewellery

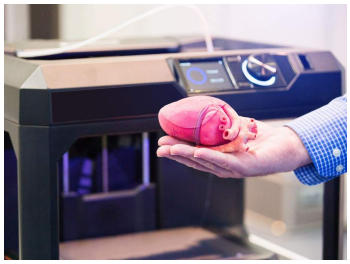

Figure 7: Artificial heart using 3D printing

4 X-Ray Machine

4.1 Introductions

It is a important medical devices use for imange purpose.
which X-rays were first discovered on November 8, 1895,by the German physicist Wilhelm Conrad Röntgen. These first generation cold cathode or Crookes X-ray tubes were used until the 1920s. The Crookes tube was improved by William Coolidge in 1913.

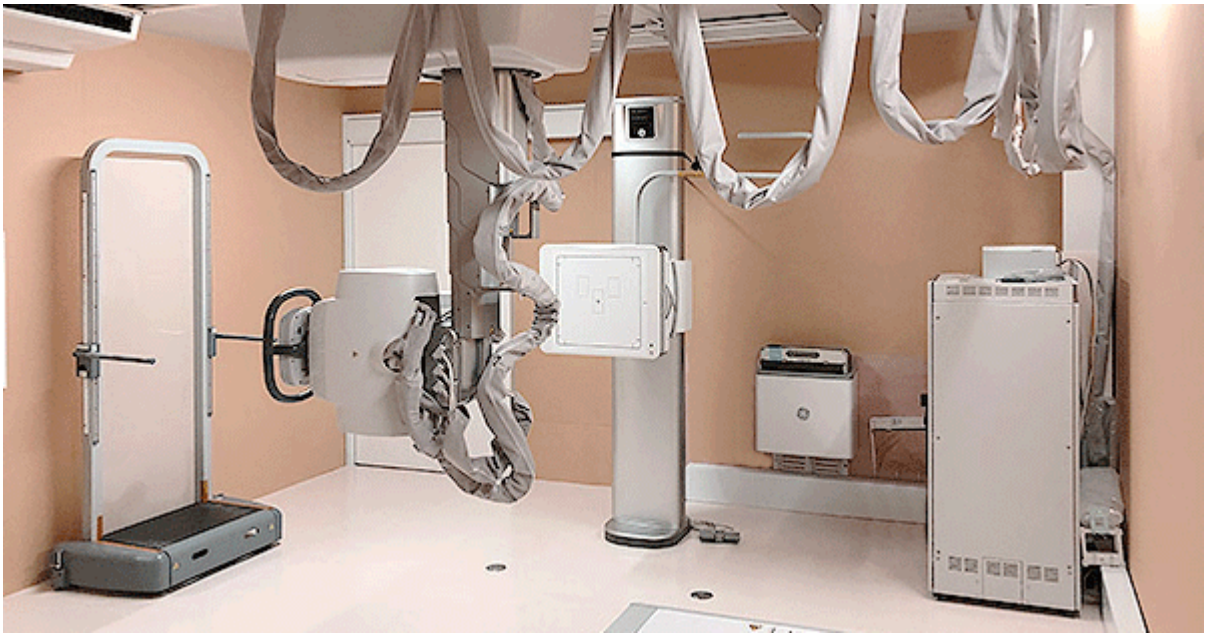

Figure 8: x-ray machine

4.2 Working principle

To create a radiograph, a patient is positioned so that the part of the body being imaged is located between an x-ray source and an x-ray detector. When the machine is turned on, x-rays travel through the body and are absorbed in different amounts by different tissues, depending on the radiological density of the tissues they pass through. Radiological density is determined by both the density and the atomic number (the number of protons in an atom's nucleus) of the materials being imaged.

4.3 Used For

X-ray radiography: Detects bone fractures, certain tumors and other abnormal masses, pneumonia, some types of injuries, calcifications, foreign objects, dental problems, etc.

Figure 9: x-rays

4.4 Risks

When used appropriately, the diagnostic benefits of x-ray scans significantly outweigh the risks. X-ray scans can diagnose possibly life-threatening conditions such as blocked blood vessels, bone cancer, and infections.

5 spirometer

5.1 introduction

A spirometer is a diagnostic device that measures the amount of air you are able to breathe in and out and the time it takes you to exhale completely after you take a deep breath. A spirometry test requires you to breathe into a tube attached to a machine called a spirometer.

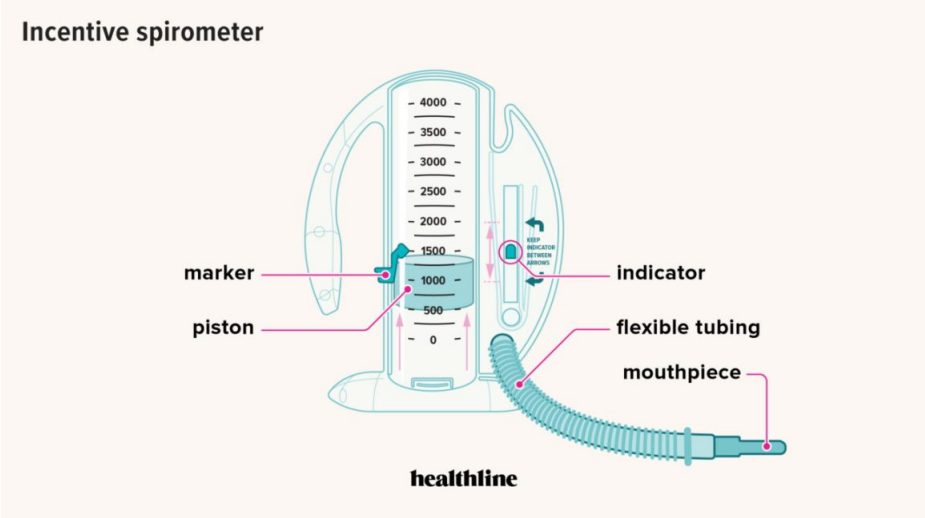

Figure 10: incentive spirometer

5.2 working principle

When a person breathes into the bell through the breathing pipe, the volume of air trapped inside it gets changed.Spirometry is one of the most readily available and useful tests for pulmonary function. It measures the volume of air exhaled at specific time points during complete exhalation by force

5.3 types of spirometer

incentive spirometer

An incentive spirometer is a device that will expand your lungs by helping you to breathe more deeply and fully.

Use your incentive spirometer after your surgery and do your deep breathing and coughing exercises. This will help keep your lungs active throughout your recovery and prevent complications such as pneumonia

peak flow spirometer

Peak flow measurement is a quick test to measure air flowing out of the lungs. The measurement is also called the peak expiratory flow rate or the

peak expiratory flow . Peak flow measurement is mostly done by people who have asthma.