

11EE312 ROBOTICS AND FACTORY AUTOMATION

(Credits 4:0:0)



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Unit 1

Fundamental concepts of Robotics

- History, Present status and future trends in Robotics and automation
- Laws of Robotics, Robot definitions
- Robotics systems and robot anatomy
- Specification of Robots – resolution, repeatability and accuracy of a manipulator
- Robotics applications

Science & Development

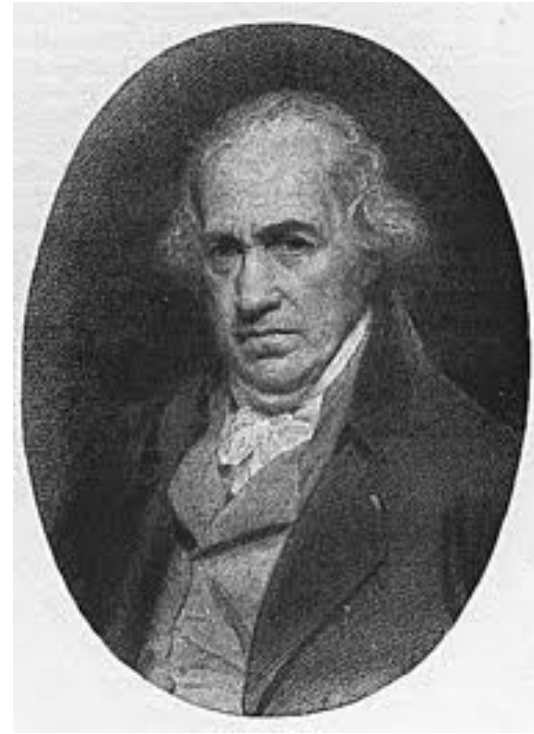
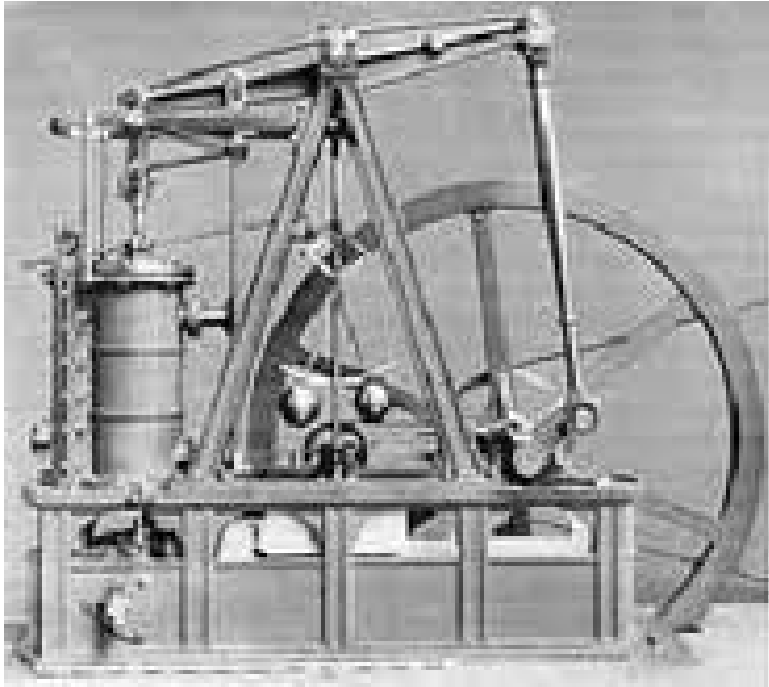
Modern science has grown to present level in four stages.

- First stage – Invention of tools
- Second stage – Steam engines & IC engines
- Third stage – Machinery & Technology
- Fourth stage – Invention of transistors and computers.



Invention of tools



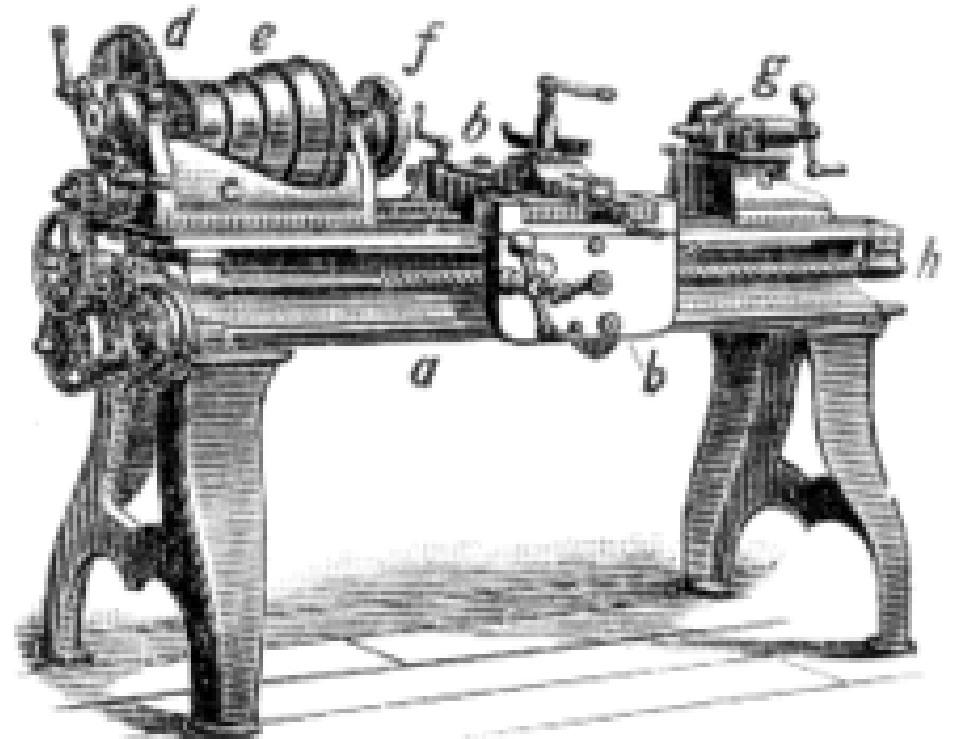


Steam and IC
engine

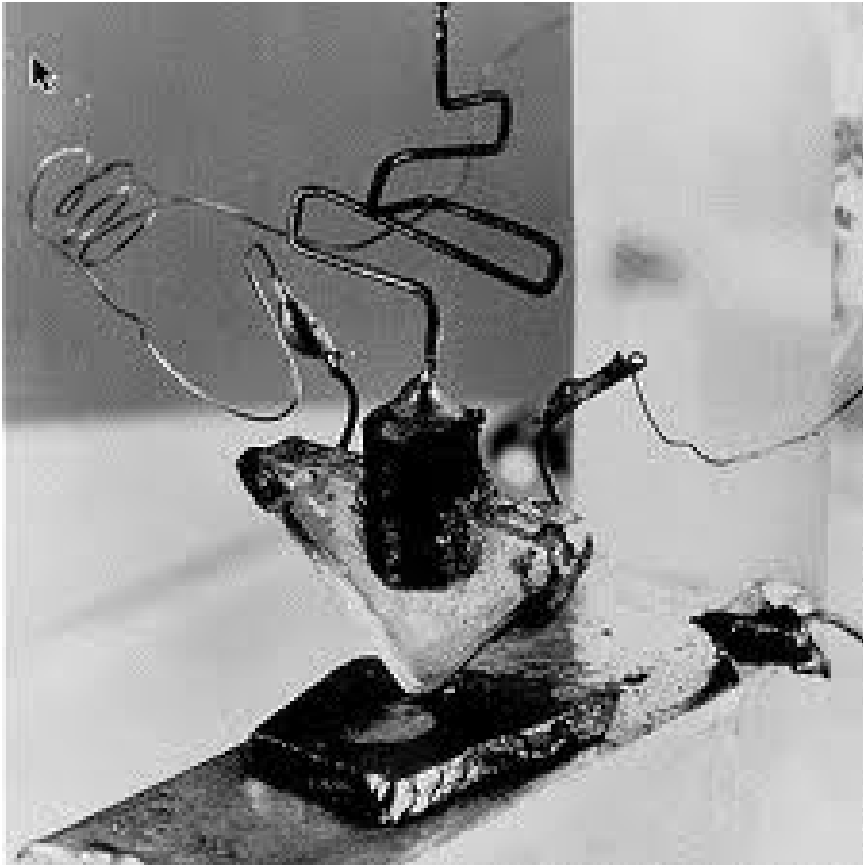




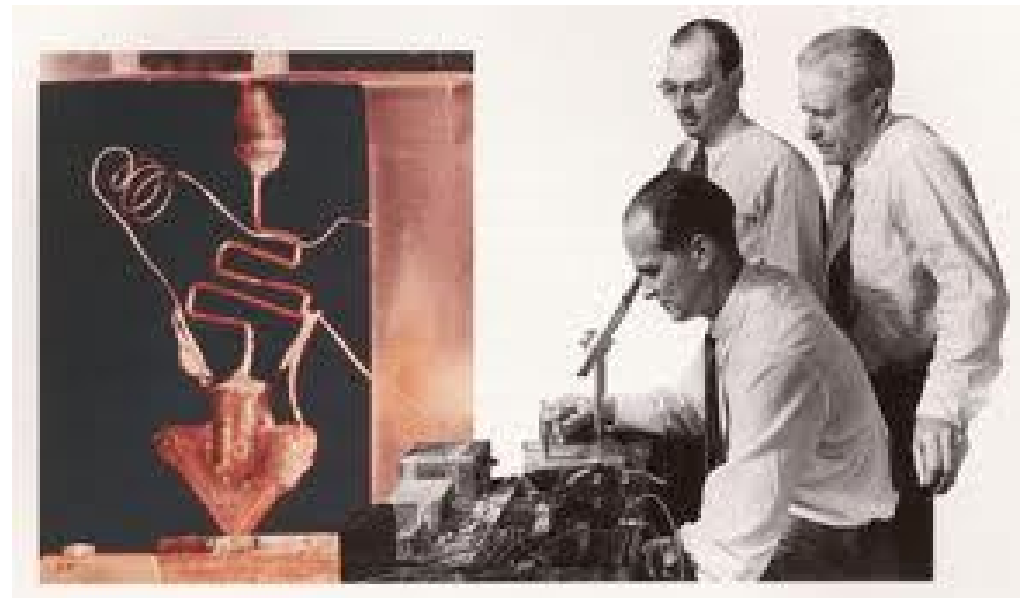
Machinery & Technology



Lathe, p. 1218.



First transistors



Robotics

- A science of designing and building robots suitable for real life applications in automated manufacturing and other non-manufacturing environments.
- Robots are the means of performing multifarious activities for human's welfare in the most planned and integrated manner.

Automation

- It is a technology dealing with the application of mechatronics and computers for production of goods and services.
- Automation is broadly classified into
 - Manufacturing automation
 - Service automation

Types of automation

- Fixed automation
 - use of custom-engineered (special purpose) equipment to automate a fixed sequence of processing
- Programmable automation
 - designed to accommodate a specific class of product changes and the processing or assembly operations can be changed by modifying the control program
- Flexible automation
 - designed to manufacture a variety of products or parts and very little time is spent on changing from one product to another.

Need...

- Shortage of labor
- High cost of labor
- Flexibility to do any work
- Enhanced productivity
- Assuring reliability
- Ensuring safety to workers
- Competition
- Reducing manufacturing lead time
- Lower costs in the long run

History

- Three stages
 - Ancient & post historic ages
 - Post industrial renaissance age
 - Microelectronics & Microprocessor age

Ancient & post historic ages

- 5000 B.C. – human & animal like figures and automated puppets were made.
- 3000 B.C. – water clocks by Egyptians, devices of sequential motions by Chinese.
- 500 B.C. – Prosthetic legs and hands
- 400 B.C. – Flying wooden pigeon, flying iron eagle, etc.,

Post industrial renaissance age

- Steam engine by James Watt.
- 1769 – 1818 – Machine tools like lathes, drilling machines and boring machines, etc.,
- 1805 – Automatic loom by J.M.Jacquard
- 1823 – Calculating machine by Charles Babbage

Microelectronics & Microprocessor age

- 1940 – First electronic computer ENIAC
- 1948 – Transistors
- 1951 – IBM 701
- 1959 – Pick and place robot, The planet corporation
- 1961 – Microprocessor technology
- 1978 – Walking robot

Future trends

- Annual sales rate per year in USA is 25% for robots.
- Reason for increase of sales rate
 - Awareness of the technology
 - User friendly and easier way to interact with hardware and software.
 - Decrease in robot cost.

Future robots

- Multiple sensor capabilities
- Computational and data processing power of mainframe computers
- Respond to human voice commands
- Able to see, hear, feel, etc.,
- Potential dangers are also involved.