Addis Ababa University

School of Commerce

Introduction to Emerging Technologies

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Course Outline

Course Name	**Introduction to Emerging Technologies**	**Credit Hour:**	**3**	**Prerequisite/ Co-requisite:**	**None**
Course Code:	EmTe-1008	**Course content**			
Synopsis:	This course will enable students to explore current breakthrough technologies in the areas of Artificial Intelligence, Internet of Things and Augmented Reality that have emerged over the past few years. Besides helping learners	**Chapter 1: Introduction to Emerging Technologies** **Chapter 2: Data Science** **Chapter 3: Artificial Intelligence (AI)** **Chapter 4: Internet of Things (IoT)**			

Chapter 1: Introduction to emerging technologies

- Chapter objective
- Emerging technologies
- Evolution of technology
- Currently available emerging technologies
- Industrial revolution
- Roles of data for emerging technologies
- Enabling devices and networks
- Human to machine interaction (HMI/HCI)
- Future emerging technologies

The objective of the chapter

After the successfully completing this chapter, the students can

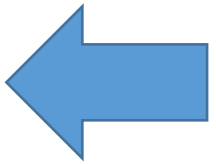
- Explain and identify emerging technologies
- Identify technological advancements that made I.R possible
- Analyze the changes created by I.R
- Explain the role of big data for emerging technologies
- Explain the 4 basic kinds of digital electronic systems with examples
- Analyze the concepts of HMI

Brainstorming

Can you define or give an example for emerging technology?

Emerging Technology

- New technology;
- The continuing development of existing technology;
- Technologies that are currently developing;
- Technologies that are expected to be available within the next five to ten years;
- Technologies that are creating or are expected to create significant social or economic effects.



Evolution of Technology

TECHNOLOGY:

- The application of scientific knowledge for practical purposes (e.g. industry)
- Machinery or equipment developed from the application of scientific knowledge.
- Branch of knowledge dealing with engineering or applied sciences.
- Tools and machines that may be used to solve real-world problems.
- Science of Mechanical and Industrial Arts

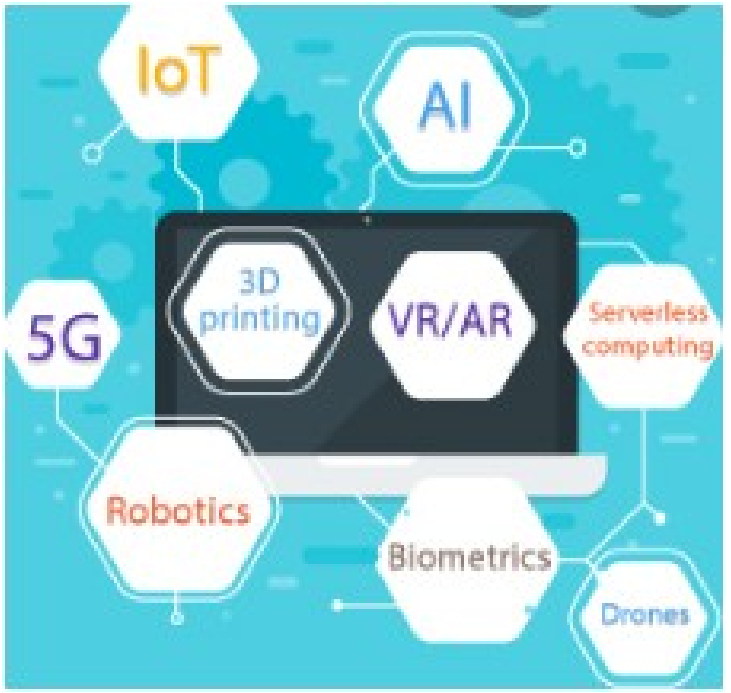
…Evolution of Technology

EVOLUTION:

- The process of developing by gradual processes.
- Example: Cellular Communication Evolution

Currently available emerged technologies

- Artificial Intelligence
- Robotics
- IoT
- 5-G
- Biometrics
- 3D printing
- Cloud Computing
- Big Data



Source: internet

Industrial Revolution (I.R)

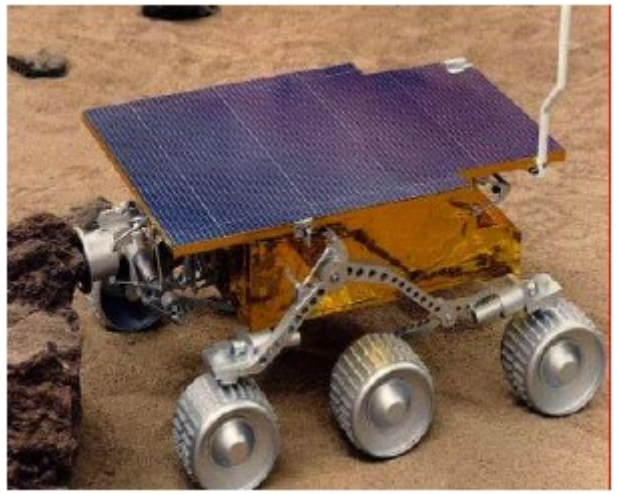
- A period of major industrialization and innovation that took place during the late 1700s and early 1800s.
- An Industrial Revolution shifts a society from using tools to make products to use new sources of energy, such as coal, to power machines in factories.
- The revolution started in England, with a series of innovations to make labor more efficient and productive.
- The Industrial Revolution was a time when the manufacturing of goods moved from small shops and homes to large factories.
- This shift brought about changes in culture as people moved from rural areas to big cities in order to work in the industries.

…Industrial Revolution (I.R)

- **First industrial revolution**: mechanization through water and steam power
  - Began in the 1760s
  - Transition from manual to machines
- **Second industrial revolution:** mass production and assembly lines using electricity
  - *…evolution*

…Industrial Revolution (I.R)

- **<u>Third industrial revolution</u>**: adoption of computers and automation
  - Nicknamed “Digital Revolution” because transition of mechanical and analog digital systems
  - Began in the 1950s
- **<u>Fourth industrial revolution</u>**: Smart and autonomous systems fueled by availability of data and machine learning.
  - Robotics
  - AI
  - IoT
  - CNC



…Industrial Revolution (I.R)

Generally, All the 4 I.Rs changed and transformed the world into modern society for the past 4 centuries.

Think about the global socio-economic impact of the industrial revolutions? Does it change our way of life?

…Industrial Revolution (I.R)

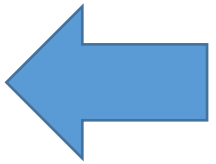
The Most Important Inventions of the Industrial Revolution

- **Transportation:** The Steam Engine, The Railroad, The Diesel Engine, The Airplane.
- **Communication:** The Telegraph. The Transatlantic Cable. The Phonograph. The Telephone.
- **Industry:** The Cotton Gin. The Sewing Machine. Electric Lights.

…Industrial Revolution (I.R)

The four types of industries are:

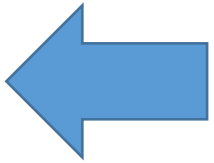
- **The primary industry** involves getting raw materials e.g. mining, farming, and fishing.
- **The secondary industry** involves manufacturing e.g. making cars and steel.
- **Tertiary industries** provide a service e.g. teaching and nursing.
- **The quaternary industry** involves research and development industries e.g. IT.



Role of Data for Emerging Technologies

Data:

- The new oil and strategic asset since we are living in the age of big data,
- Drives or even determines the future of science, technology, the economy, and possibly everything in our world today and tomorrow.
- Presents enormous challenges that in turn bring incredible innovation and economic opportunities.
- Involves not only core disciplines such as computing, informatics, and statistics, but also the broad-based fields of business, social science, and health/medical science.



Enabling devices and networks (Programmable devices)

Four basic kinds of digital electronic systems:

1. Memory devices: store some information (e.g. spreadsheet, database)
2. Microprocessors: execute instructions (programs) to process data

   E.g. word processing, video game
3. Logic devices: provide specific functions like device-to-device interfacing, data communication, signal processing, data display, timing and control operations.
4. Network: is collection of computers, servers, mainframes, network devices, peripherals connected together to allow sharing of data or other resources.

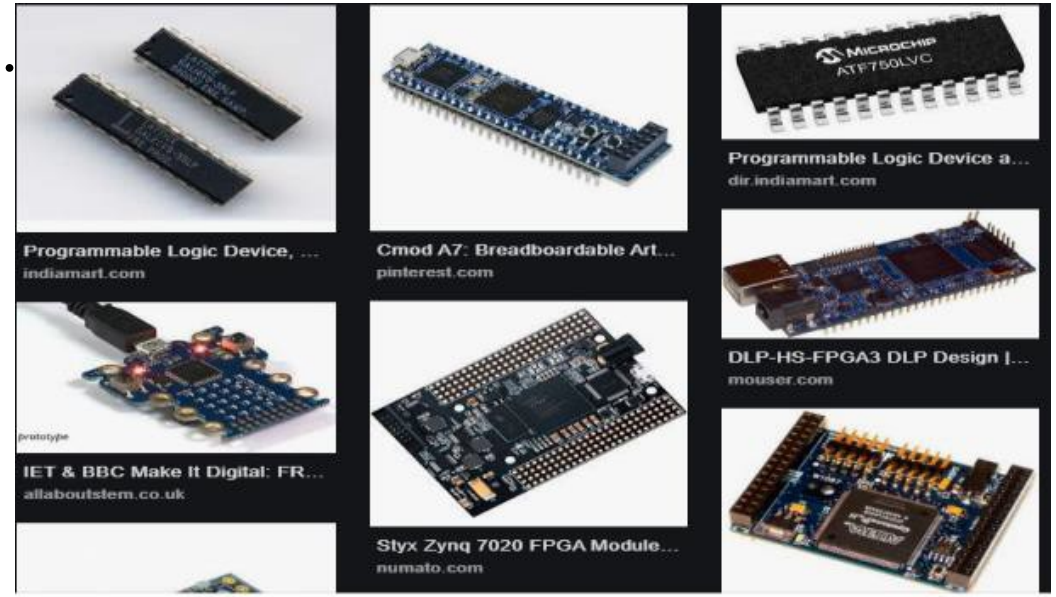
➢The Internet is the biggest network we have.

… Enabling devices and networks (Programmable devices)

Programmable devices are chips that incorporate:

- Field Programmable logic devices (FPGAs),
- Complex programmable logic devices (CPLD), and
- Programmable logic devices (PLD).

There are also devices that are the analog equivalent of these called field programmable analog arrays.



… Enabling devices and networks (Programmable devices)

Computer:

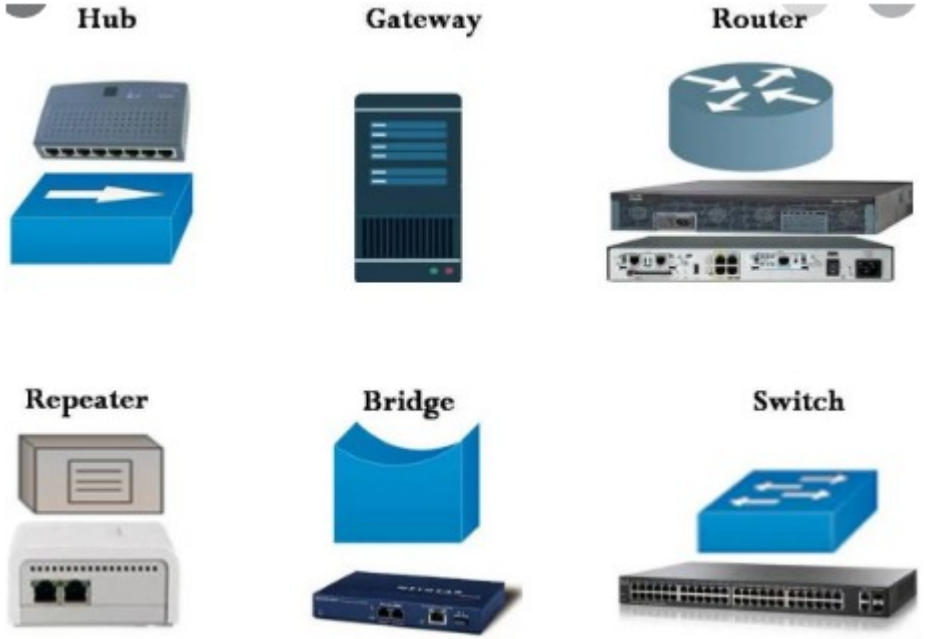
- Is the most common programmable device: it can be programmed to follow a set of instructions and produce some results.
- Has different types depending on their purposes
  - Small computers (many electronic devices we use such as calculators, phones, …) perform only one or small number of operations, but still they are programmed to follow a certain set of instructions to achieve that.

List of some Programmable devices

- Achronix Speedster SPD60
- Actel’s
- Altera Stratix IV GT and Arria II GX
- Atmel’s AT91CAP7L
- Cypress Semiconductor’s programmable system-on-chip (PSoC) family
- Lattice Semiconductor’s ECP3
- Lime Microsystems’ LMS6002
- Silicon Blue Technologies
- Xilinx Virtex 6 and Spartan 6
- Xmos Semiconductor L series

Network-related equipment's (Service Enabling Devices) (SEDs)

- Traditional channel service unit (CSU) and data service unit (DSU)
- Modems
- Routers
- Switches
- Conferencing equipment
- Network appliances (NIDs and SIDs)
- Hosting equipment and servers



Source: internet

Human to Machine Interaction

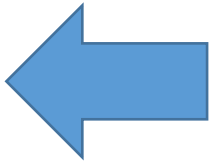
- Refers to the communication and interaction between a human and a machine via a user interface.
- Natural interfaces becoming so common: devices are capable of understanding some of human gestures.
- HCI – is the study of how people interact with computers and to what extent could computers interact with human beings successfully.
- Human to Machine Interaction (HMI) is also sometimes called Human to Computer Interaction (HCI)
- HCI improves the interaction between users and computers by making computers more user-friendly and receptive to the user's needs.

…Human to Machine Interaction

- Three components in HCI:
  - The user
  - The computer
  - The interaction (how they interact with each other).
- Users interact with computers using input/output devices
  - Displays – displaying graphical user interfaces which the user could use to send commands to the computer or receive results from the computer
  - Input devices (KB, mouse) allowing inputs to computer

Disciplines Contributing to Human-Computer Interaction (HCI)

- Cognitive psychology: Limitations, information processing, performance prediction, cooperative working, and capabilities.
- Computer science: Including graphics, technology, prototyping tools, user interface management systems.
- Linguistics.
- Engineering and design.
- Artificial intelligence.
- Human factors.



Future emerging technologies

Emerging technologies that will shape the future of us and our business are:

- Chatbots,
- Virtual/augmented reality,
- Blockchain,
- Ephemeral Apps and
- Artificial Intelligence

END!!