

A complex network graph is displayed against a dark blue background. The graph consists of numerous small, glowing white dots representing nodes, connected by a web of thin white lines representing edges. The overall effect is a sense of a large, interconnected system.

Introduction To Information and Communication Technology (ICT)

CS202 Lecture # 1

Prof. Dr. S. M. Hasan Zaidi

Introduction of Course Instructor and Students

Introduction of the Course

- A **Bird-Eye View of Computer Science, Software, and Networks**
Working Together to Support the Digital World
- **Wide Range of Topics:**
 - Computer Basics
 - Organization and Hardware
 - Operating Systems
 - Databases
 - Computer Networks
 - IoT
 - 4G/5G/6G
 - Data Visualization
 - Cybersecurity
 - AI/ML/DL
 - Ethical Implication of Technology
- Recent and Future **Trends** in ICT

Course Objectives

- Provide **Comprehensive Understanding** of Information and Communication Technology (ICT) and its Applications
- Develop **Foundational Knowledge** of ICT Concepts, Tools, and Techniques, Including Data Management, Networking, Web Technologies, Cybersecurity, and Cloud Computing
- Apply **ICT Skills** to Solve Real-World Problems, Enhance Communication, and Support Business Operations, through a Combination of Theoretical Lectures and Project-Based Assignment
- Emphasize **Critical Thinking, Problem-Solving, and Ethical Considerations** in the Use of ICT in Today's Digital Age

ICT Latest Advancements



5G/6G Technology



Artificial Intelligence
(AI) and Machine
Learning (ML)



Quantum
Computing



Blockchain and
Distributed Ledger
Technologies



Augmented Reality
(AR) and Virtual
Reality (VR)



IoT and Smart
Technologies



Cloud Computing
and Hybrid Cloud
Solutions



Digital Twins

5G Technology

Definition:

5G is the fifth generation of mobile networks, offering ultra-fast, low-latency communication.

Key Features:

- Speed: Up to 10 Gbps (100× faster than 4G)
- Latency: As low as 1 ms
- Supports massive device connectivity

Applications:

- Autonomous vehicles
- Remote surgeries & telemedicine
- Smart cities and IoT ecosystems
- Enhanced AR/VR experiences



6G Technology

Definition:

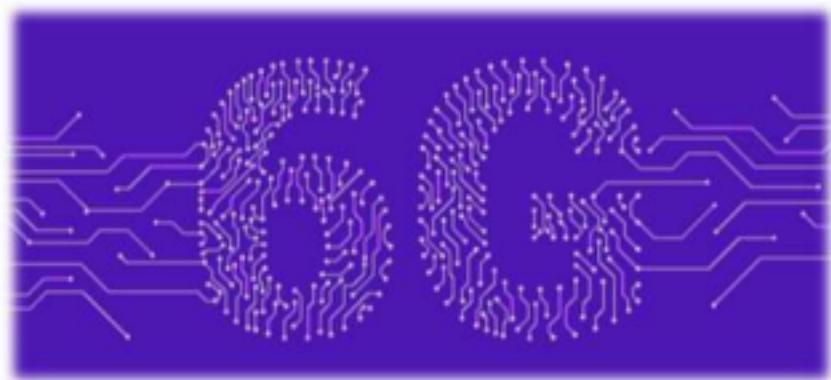
6G is the sixth generation of mobile networks, expected to succeed 5G, offering ultra-fast, AI-driven, and ubiquitous connectivity by 2030.

Key Features:

- Speeds up to **1 Tbps** (100× faster than 5G)
- Ultra-low latency (microseconds)
- AI-native networks (self-optimizing and intelligent)
- Integration of terahertz (THz) frequencies
- Seamless space-air-ground-sea communication

Applications:

- Holographic communication
- Fully immersive XR (AR/VR/MR)
- Autonomous drones and vehicles
- Smart healthcare with real-time digital twins
- Global connectivity via **satellite–5G/6G hybrid systems**



Artificial Intelligence (AI) & Machine Learning (ML)

Definition:

AI: Machines simulating human intelligence

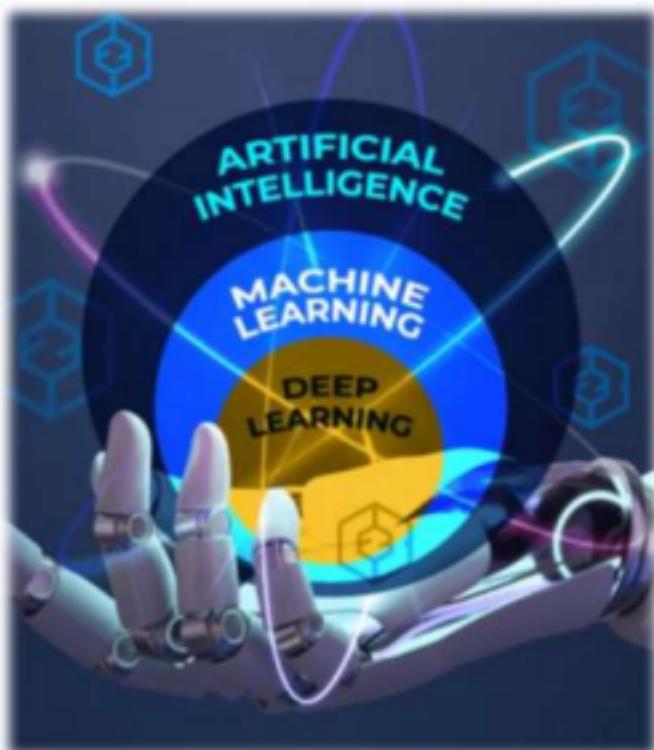
ML: Algorithms that learn from data without explicit programming

Key Features:

- Pattern recognition
- Predictive analytics
- Natural Language Processing (NLP)

Applications:

- Virtual assistants (Siri, Alexa)
- Fraud detection in banking
- Personalized recommendations (Netflix, Amazon)
- Industrial automation & robotics



Quantum Computing

Definition:

Quantum computers use quantum bits (qubits) to process information, enabling parallel computation.

Key Features:

- Superposition & Entanglement
- Exponential processing power
- Solves problems classical computers can't

Applications:

- Cryptography & cybersecurity
- Drug discovery and molecular modeling
- Financial market predictions
- Optimization in logistics and AI



Blockchain & Distributed Ledger Technologies

Definition:

Blockchain is a decentralized digital ledger where transactions are recorded across multiple computers securely.

Key Features:

- Transparency & immutability
- Decentralization (no central authority)
- Enhanced security

Applications:

- Cryptocurrencies (Bitcoin, Ethereum)
- Supply chain tracking
- Smart contracts
- Voting systems



Augmented Reality (AR) & Virtual Reality (VR)

Definition:

AR: Overlays digital elements on real-world environments

VR: Fully immersive digital environment

Key Features:

- Interactivity
- Real-time 3D visualization
- Enhanced simulations

Applications:

- Education & training simulations
- Gaming & entertainment
- Virtual tourism
- Retail & product visualization



IoT & Smart Technologies

Definition:

IoT connects physical devices to the internet to collect and share data.

Key Features:

- Device-to-device communication
- Real-time monitoring & analytics
- Automation & smart control

Applications:

- Smart homes (Alexa, Google Home)
- Smart cities (traffic management, energy grids)
- Wearables (fitness trackers, smartwatches)
- Industrial IoT (predictive maintenance)



Cloud Computing & Hybrid Cloud Solutions

Definition:

Cloud computing delivers computing services (storage, processing, networking) over the internet.

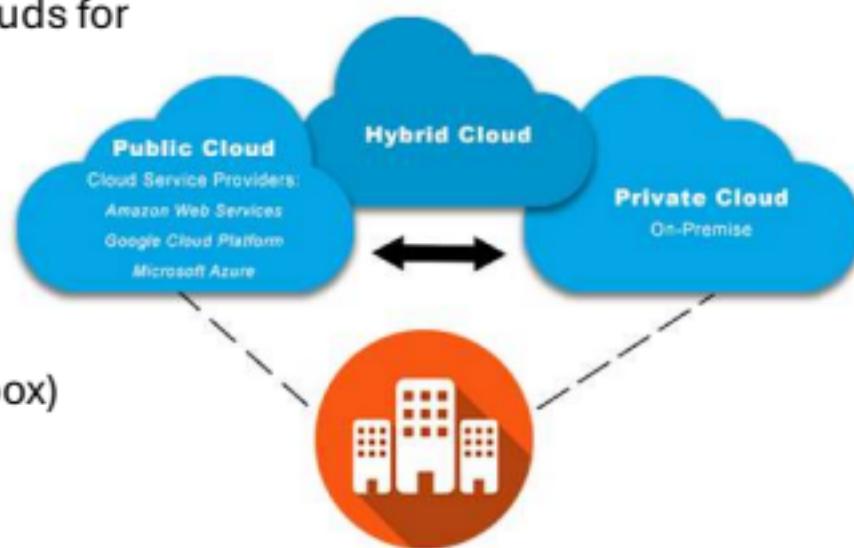
Hybrid cloud combines public and private clouds for flexibility.

Key Features:

- On-demand scalability
- Cost-efficiency
- Accessibility from anywhere

Applications:

- Data storage & backup (Google Drive, Dropbox)
- SaaS (Microsoft 365, Zoom)
- Enterprise IT solutions
- Hybrid setups for security + scalability



Digital Twins

Definition:

A digital twin is a virtual replica of a physical object, system, or process, updated with real-time data.

Key Features:

- Real-time synchronization
- Simulation & predictive modeling
- Data-driven decision-making

Applications:

- Smart manufacturing & Industry 4.0
- Predictive maintenance of machines
- Healthcare (patient monitoring)
- Smart cities & infrastructure planning



Reading Assignment

Book: Understanding Computers: Today and Tomorrow. Comprehensive by Deborah Morley, Charles S. Parker (16th Edition), Cengage Learning, 2017

Read:

- Chapter 1 Introduction to the World of Technology – 4
 - Overview – 5
 - Technology in Your Life – 5
 - Why Learn About Computers and Technology? – 6
 - Computing Devices in the Home – 7
 - Computing Devices in Education – 7
 - Computing Devices on the Job – 8
 - Computing Devices on the Go – 9

Thank You !

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