Welcome to this course! My name is Jasleen Kaur and I'm the instructor for this course.

We'll spend today's class talking about the course outline, the course requirements, and your first homework.

But before we do that, I'd like for us all to spend some time and introduce ourselves. So if each of you can say 3 things: (1) what is your name, (2) what is your major and year, and (3) what is it that you expect to learn from this course.

So let me begin: my name is Jasleen and I conduct research in the design and analysis of networks and distributed systems. And I'm looking forward to a semester-worth of exchanging ideas with all of you.

How many have NOT had socket programming?

What do you think is the “Internet”?

There are two ways to think about it: one is the components that make up the Internet. This would be a nuts-and-bolts view where we can talk about several acronyms and terms that you may have come across, such as web, TCP/IP, inter-network, routers, switches, and so on...

The second way to think about it is the one that is more common, which is in terms of the services and applications that run over the Internet. So all of us do web-browsing, exchange emails, share files.

The important point to note is that these applications we care about do not operate solely by themselves. There are numerous services at the software layer at all two work together to provide a seamless view that a particular application is doing everything by itself.

— In this class we expose some of the seams. The services that enable such applications are all part of the Internet. So we will spend time talking about how these services work?

Transport Protocols
What Issues Will We Focus On?

- Basic functionality:
  - Provide a “process-to-process” communication channel
    - Versus the host-to-host abstraction provided by the lower layers
  - Wish-list from such a channel:
    - Guarantees message delivery
    - Guarantees in-order delivery
    - Guarantees no duplicate messages
    - Supports arbitrarily large messages
    - Guarantees bounded delay
      - Helps support synchronization between the sender and the receiver
    - Allows receiver to control data flow from sender
    - Supports multiple application processes on each host
  - Security

How to provide these services on top of IP's best-effort service?
There are two ways to think about the Internet:

1. **Components Approach**
   - In terms of the components that make up the Internet.
   - This would be a nuts-and-bolts view in which we can talk about several acronyms and terms:
     - **TCP/IP**
     - **Inter-networking**
     - **Routers**
     - **Switches**

2. **Services Approach**
   - The second way is the service-oriented approach.
   - In terms of the services and applications that run over the Internet.
   - All of us do web-browsing, exchange emails, share files.

   **Important Point:**
   - These applications we care about do not operate solely by themselves.
   - There are numerous services that work together to provide a seamless experience.

   **Application:**
   - Some applications do everything by themselves.
   - In this class, we expose some of the seams. The services that enable such applications are all part of the Internet.
   - We will spend time talking about how these services work.

### User Datagram Protocol (UDP)

#### Multiplexing/Demultiplexing

- **Simplest possible service**
  - Just extend from host-to-host to process-to-process communication
  - Simply add a level of de-multiplexing
    - Since there may be several processes running on a host

- **How to identify processes?**
  - **Process IDs**
    - OS-dependent (will work only in networks where everyone runs same OS)
  - **Ports/mailboxes**
    - Abstract locator for sending messages to and receiving messages from
    - Allows multiple channels to be established in same process
    - Host-local scope; host ID + port number uniquely identify a channel

- **How to learn of destination port number?**
  - Servers use well-known port numbers (or port-mapper service)

### User Datagram Protocol

#### Segment Format

- **16-bit port identifiers used**
  - Considered enough for host-local scope

- **Checksum is optional**
  - Same algo as IP checksum (sum of 16-bit words)
  - Computed on the “pseudo-header” = UDPheader + Data
    - Pseudo-header = (protocol, srcIP, dstIP, UDPlength) fields
    - Includes fields already included in the IP checksum
There are two ways to think about it: in terms of the components that make up the Internet (web, TCP/IP, inter-network, routers, switches, etc.) and in terms of the services and applications that run over the Internet. All of us do web-browsing, exchange emails, share files. The important point to note is that these applications we care about do not operate solely by themselves. There are numerous services that work together to provide a seamless application. In this class, we will expose some of the seams. The services that enable such applications are all part of the Internet, and we will spend time talking about how these services work.
There are two ways to think about the Internet:

1. In terms of the components that make up the Internet, which includes acronyms and terms such as web, TCP/IP, and routers.

2. In terms of the services and applications that run over the Internet, such as web-browsing and exchanging emails.

It's important to note that applications run on top of these services, and services are part of the Internet. In this course, we will cover how these services work and the seams where they are not self-sufficient.