Networked Systems

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Networking Research Publications

Number of Networking Conferences

Time

Time
One Possible Academic Response

Computer Science

Networking
Middleware
Wireless Networks

Electrical Engineering

Networking
Wireless Networks
"Information Superhighway"
Networked Systems

Intersection

CS

EE

Networks

Math
### Core Courses

**Computer Networks**

**Computer Networks Laboratory**

**Networked Systems Seminar**

### Breadth Courses

<table>
<thead>
<tr>
<th>CSE Breadth</th>
<th>Management of Technology Breadth</th>
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<tbody>
<tr>
<td>System Software</td>
<td>Educational Technology</td>
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<tr>
<td>Databases</td>
<td>Educational Policy and Reform</td>
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<tr>
<td>Cryptography &amp; Computer Security</td>
<td>New Information and Comm. Technologies</td>
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<tr>
<td>Algorithms</td>
<td>School Restructuring</td>
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<tr>
<td>Graph Algorithms</td>
<td>Information Technology for Management</td>
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<tr>
<td>Data Structures</td>
<td>The Network Economy</td>
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<tr>
<td>Computer Architecture</td>
<td>Strategic Information Systems</td>
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<td>Integrated Circuits</td>
<td>E-Commerce</td>
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<tr>
<td>Random Processes</td>
<td>Social Analysis of Computing</td>
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<tr>
<td>Linear Systems</td>
<td>Computer-Supported Cooperative Work</td>
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<td></td>
<td>Computing and Cyberspace</td>
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<td></td>
<td>Political/Social Impacts of Computing</td>
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<td>Technology and Development</td>
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### Networks Concentration

<table>
<thead>
<tr>
<th>Advanced Networks</th>
<th>Performance Concentration</th>
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<tbody>
<tr>
<td>Internet Technology</td>
<td>Performance Analysis of Computer Networks</td>
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<tr>
<td>Wireless &amp; Mobile Networking</td>
<td>Queueing Networks</td>
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<tr>
<td>Network Security</td>
<td>Computer Network Characterization</td>
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<tr>
<td>Embedded Computing Systems</td>
<td>Optimization Techniques for Networks</td>
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<td>Computer Systems Modeling &amp; Perf. Evaluation</td>
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### Middleware Concentration

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<thead>
<tr>
<th>Distributed Systems Middleware</th>
<th>Communications Concentration</th>
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<tbody>
<tr>
<td>Multimedia Systems &amp; Applications</td>
<td>Detection, Estimation &amp; Modulation</td>
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<tr>
<td>Real-time Computer Systems</td>
<td>Communication &amp; Information Theory</td>
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<tr>
<td>Fault-Tolerant Computing</td>
<td>DSP</td>
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<tr>
<td>Distributed Computer Systems</td>
<td>Linear Systems</td>
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<tr>
<td>Distributed Software Architecture</td>
<td>Digital Image Processing &amp; Understanding</td>
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<td>Data Compression</td>
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### Operations Research Concentration

<table>
<thead>
<tr>
<th>Management Science</th>
<th>Transportation Systems Analysis</th>
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<td>Stochastic Models</td>
<td>Urban Transportation Networks</td>
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M.S. Degree Requirements:

- The 3 Core courses
- 3 Breadth courses (<= 2 from Management and Applications of Technology list)
- 5 Concentration courses (covering >= 3 concentrations)
- Thesis OR 2 additional courses (breadth and/or concentration, <= 1 from Manag./Apps.)

Ph.D. Degree Requirements:

- The 3 Core courses
- 4 Breadth courses (<= 2 from Management and Applications of Technology list)
- 6 Concentration courses (covering >= 3 concentrations)
- 2 additional courses (advisor approval)
- 3 teaching practicums
- Dissertation
Computer Networks

- Data link layer: error detection and correction.
- Local Area Networks: ALOHA, Ethernet, Gigabit Ethernet, token ring.
- Layered architectures: OSI, TCP protocol stack.
- IP: addressing, subnets, ARP, basic routing
- TCP: ABP, SRP, TCP flow & congestion control.
- Project presentations.

Computer Networks Laboratory

- Single segment networks: AR
- IP, IP addresses, subnet masks, NAT, DHCP, DNS.
- Static routing: router configurations
- Dynamic routing: RIP, OSPF.
- Link layer switches: bridge configurations, spanning trees.
- Transport layer: UDP, FTP, TFTP, TCP.
**Advanced Networks**

- ATM: virtual circuits, cell switches, integrated services, service classes, QoS.
- Addressing: NAT, DHCP, DNS.
- Routing: advanced IP routing, IP switching, MPLS, multicast.
- Streaming: RTP, RTCP.
- QoS: scheduling, IntServ, diffServ, adaptation, smoothing, admission control, policy servers.
- Optical networks.

**Internet Technology**

- Client/server: architectures, proxy servers.
- WWW: http, web applications, caching.
- File sharing: peer to peer protocols & architectures.
- Group communications.
- Internet programming.
Wireless and Mobile Networking

- Wireless transmission: signals, modulation, multiplexing, cellular.
- Media access: FDMA, TDMA, CDMA, ALOHA, reservations, collisions, polling.
- Wireless telecommunications: GSM, IS95.
- Wireless LANs: 802.11, Bluetooth.
- Network protocols: Mobile IP, ad-hoc network routing.
- Transport protocols: TCP modifications for mobility.
- Mobility support: file systems, databases, WWW, WAP.
- Cellular: architecture, evolution.

Network Security

- Overview of cryptography: ciphers, shared- and public-key encryption, digital signatures
- Authentication
- Privacy
- Access control
- Security in mobile/wireless networks
- Internet security protocols
Performance Analysis of Computer Networks

- Error correction codes and data link layer protocols.
- Queuing models for communication networks.
- Multi-access communication.
- Flow and congestion controls.
- Routing and admission control.
- Mathematical modeling and optimization of network performance and design.

Queueing Networks

- Random processes: properties, increments.
- Poisson processes: characterization, properties, multiplexing.
- Markov chains: discrete time characterization, properties, stationary distribution, continuous time.
- Queues: model, performance measures, finite buffers, multiple servers, non-exponential distributions.
- Simulation: time driven, event driven, data analysis.
**Distributed Systems Middleware**

- Fundamentals: distributed systems, middleware, concurrency, adaptive systems
- Distributed systems management: distributed OS, messaging, communication, distributed I/O, storage subsystems, distributed resource management
- Distributed objects: models, common object services, synchronization, composition
- Middleware frameworks: DCE, CORBA, Jini, E-speak, metacomputing
- Middleware for distributed application environments: QoS, fault-tolerance, security, real-time, & embedded applications, ubiquitous & mobile environments
Administrative Home?

Networked Systems

CS Dept.

EE Dept.