



CGS 4285
Applied Computer Networking
Credits: 3

Course Prerequisites

CGS 3767

Prerequisites Topics

- Discrete Math
- Basic programming

Official Catalog Course Description

Principles of computer network design, operation and management. Topics include network protocols, network configuration and network security.

Course Outcomes

Static across all sections

Outcome (Bloom’s Taxonomy)		Degree Outcome(s)	ABET Topic(s)
1.	Describe the TCP/IP protocol stack. [Understanding]	B*1	CONN
2.	Compare the client-server and peer-to-peer application architectures. [Analyzing]	B*1	SYS
3.	Describe TCP and UDP segment structures. [Understanding]	B*1	CONN
4.	Apply routing algorithms. [Applying]	B*2	CONN
5.	Compare Layer 3 routing and Layer 2 switching. [Analyzing]	B*1	CONN
6.	List wireless Medium Access Control protocols. [Remembering]	B*1	CONN

7.	Contrast digital signatures and digital certificates. [Evaluating]	BS-CY 6 BS-IT 6	DATA
8.	Explore network security, including protocols and tools. [Applying]	BS-CY 6 BS-IT 6	CONN
9.	Analyze networks, including AI-powered and other tools, in team-based course projects. [Applying]	B*5	CONN

Degree Outcome(s) are only required for assessment courses. If a course is used to submit assessment data for a degree, it should include the outcome(s) of that degree for which it is used (Page 6). Other courses can complete this section if they choose.

ABET Topic(s) are only required for required courses in KE-SCIS BS degrees. They should include topic(s) within the degree program(s) where the course is required (Pages 7-8). Other courses can complete this section if they choose.

Textbook and Course Materials

[Required] James Kurose and Keith Ross, Computer Networking: A Top Down Approach (9th Edition), Pearson, 2025. ISBN: 978-0135429334.

[Reference] Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, <https://book.systemsapproach.org/>.

Faculty can override the default

Curriculum: Weekly Schedule, Topics and Required Readings

Faculty can override the default

Week	Topic and Required Reading	Course Outcome(s)	Cred Hrs	Lec Hrs*
1.	<ul style="list-style-type: none"> • Introduction <ul style="list-style-type: none"> ○ Internet components ○ TCP/IP protocol stack 	1	0.15	2
2.	<ul style="list-style-type: none"> • Application layer <ul style="list-style-type: none"> ○ Application architectures ○ HTTP 	2	0.15	2
3.	<ul style="list-style-type: none"> • Application layer <ul style="list-style-type: none"> ○ DNS ○ BitTorrent 	2	0.15	2

4.	<ul style="list-style-type: none"> • Transport layer <ul style="list-style-type: none"> ○ Multiplexing and demultiplexing ○ Reliable data transfer 	3,9	0.22	3
5.	<ul style="list-style-type: none"> • Transport layer <ul style="list-style-type: none"> ○ TCP ○ UDP 	3,9	0.22	3
6.	<ul style="list-style-type: none"> • Network layer <ul style="list-style-type: none"> ○ Data plane and control plane ○ Routing algorithms 	4,9	0.22	3
7.	<ul style="list-style-type: none"> • Network layer <ul style="list-style-type: none"> ○ Routing protocols ○ IP 	4,9	0.22	3
8.	<ul style="list-style-type: none"> • Software defined networking 	4,9	0.08	1
9.	<ul style="list-style-type: none"> • Link layer <ul style="list-style-type: none"> ○ Error detection ○ Multiple access control 	5,9	0.15	2
10.	<ul style="list-style-type: none"> • Switching 	5,9	0.15	2
11.	<ul style="list-style-type: none"> • Wireless networks <ul style="list-style-type: none"> ○ CDMA ○ CSMA/CA ○ Switching between networks 	6	0.22	3
12.	<ul style="list-style-type: none"> • Wireless LANs 	6	0.08	1
13.	<ul style="list-style-type: none"> • Network security <ul style="list-style-type: none"> ○ Cryptography ○ Message integrity 	7,8,9	0.15	2
14.	<ul style="list-style-type: none"> ○ Digital signatures ○ Digital certificates 	7,8,9	0.15	2
15.	<ul style="list-style-type: none"> • Network security protocols 	7,8,9	0.08	1
16.	<ul style="list-style-type: none"> • Final Exam 			

* Lecture hours should assume a normal term (16 weeks)*(2.5 hours/week) = 40 hrs total. The number need not total 40 but should not go past.

Credit Hours are computed as ((Lec Hours)/40)*(Course Credits).
Example, for an 8-hour topic in a 3-credit course: (8/40)*3 = 0.6

Faculty can override the default

Goals, Objectives, and Student Expectations

Required by the University

Faculty can override the default

Success in this course requires self-motivation and discipline. Students are expected to attend lectures, complete weekly quizzes, review assignment solutions, and actively participate in group projects.

While the instructor and teaching or learning assistants are available to support your learning, it is the student's responsibility to engage with the material and demonstrate mastery of the course content.

Student Evaluation Practices

Required by the University

Faculty can override the default

Students will be assessed through quizzes, assignments, group projects, and exams. Quizzes reinforce key concepts, while assignments allow application of course material to practical problems. Group projects develop collaboration and hands-on experience, and exams comprehensively evaluate understanding, problem-solving, and reasoning skills. These assessments together measure both comprehension and the ability to apply knowledge effectively.

Grading Weights

- 10% Quizzes
- 40% Assignments and Projects
- 25% Midterm exam
- 25% Final exam

Grading Scale

Grade	Range
A	95% - 100%
A-	90% - 94.99%
B+	87% - 89.99%
B	83% - 86.99%
B-	80% - 82.99%
C+	77% - 79.99%

C	70% - 76.99%
D	60% - 69.99%
F	Below 60%

Required – show the numeric breakdown for letter grades

Policy for Make-Up Work

Required by the University

Faculty can override the default

To receive a make-up exam for a missed exam, the student must notify the instructor before the end of the originally scheduled exam and provide written documentation to justify the absence.

Assignments submitted past the deadline will be penalized at a rate of 20% of the total possible score for each late day.

Attendance Standards

Required by the University if the faculty enforces attendance

Faculty can override the default and choose to omit this section from their syllabus if they do not require attendance

Regular attendance at all lectures is expected.

Academic Integrity and GenAI

Recommended, but not required, by the University

Faculty can override the default and choose to omit this section from their syllabus

All work submitted in this course must represent the student's own effort. Submitting text, images, or other materials from online sources, published works, or other individuals without proper attribution is considered plagiarism and is prohibited.

The use of Artificial Intelligence (AI) or generative AI tools is permitted only as a learning or study aid unless otherwise specified by the instructor. Submitting AI-generated content as one's own work constitutes academic dishonesty. Students must be able to explain,

justify, and reproduce any work they submit. Any violation of these expectations will be addressed in accordance with the university's academic integrity policies.

Supplementary Material

This section can include any material the developer sees as useful to an instructor teaching the course for the first time.

Sample Assignments and Rubrics

Project 1: Wireshark Introductory Lab

In this project, students will learn how to capture and examine packets using the Wireshark network protocol analyzer, a popular open-source tool used for network troubleshooting, analysis, and protocol development.

Project 2: Wireshark TCP Lab

In this project, students will use the Wireshark network protocol analyzer to capture and analyze a trace of TCP segments, demonstrating their understanding of the TCP protocol and its behavior.

Project 3: Mininet Introductory Lab

In this project, students will learn to use Mininet, a virtual testbed for experimenting with network tools and protocols. Mininet creates a virtual network on a desktop or laptop computer. Students will learn to invoke Mininet from the command-line interface (CLI), build and emulate network topologies using a graphical user interface (GUI) application, and use the iPerf tool to measure network performance.

Project 4: Mininet Network Troubleshooting and Security

In this project, students will use Mininet to practice network troubleshooting and basic security skills. They will learn how to properly configure networks for hosts and routers and apply troubleshooting techniques to identify and resolve network errors. In addition, they will develop foundational skills for detecting and defending against common security threats.

Assessment Methods by Topic

Other Helpful Materials

This section will be kept private and faculty can choose which (if any) resources they wish to use in their section(s)

Assessment Assignments and Rubrics

Static, and for assessment courses only

If the course is used to submit assessment data for a degree outcome, include the degree outcome and its corresponding assignment and rubric used for assessment.

This section will be kept private

Reference: Degree Outcomes

KF-SCIS has streamlined degree outcomes across both SACS and ABET. The list of degree outcomes, by degree, can be summarized by the following table:

ID	Degree Outcome
B* 1	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
B* 2	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
B* 3	Communicate effectively in a variety of professional contexts.
B* 4	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
B* 5	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
BS-CS 6	Apply computer science theory and software development fundamentals to produce computing-based solutions.
BA-CS 6	Apply software development fundamentals to produce computing-based solutions.
BS-CY 6	Apply security principles and practices to maintain operations in the presence of risks and threats.
BS-DS 6	Apply theory, techniques, and tools throughout the data science lifecycle and employ the resulting knowledge to satisfy stakeholders' needs.
BS-IT 6	Use systemic approaches to select, develop, apply, integrate, and administer secure computing technologies to accomplish user goals.
BA-IT 6	Use systemic approaches to select, integrate, and administer secure computing technologies to accomplish user goals.
MS-CS 1	Identify and apply fundamental theories to solve problems within the field of computing.
MS-CS 2	Design and implement significant theoretical results that improve efficiency of computing solutions.
MS-CS 3	Accurately analyze the complexity of algorithms using rigorously mathematical techniques.
MS-CY 1	Apply knowledge of access control and network security to properly authenticate a user.
MS-CY 2	Build security properties using block ciphers and encryption modes.
MS-CY 3	Describe public-key encryption systems and their security properties.
MS-DS 1	Analyze and visualize a dataset using modern toolkit(s).
MS-DS 2	Communicate effectively within the field of data analytics (oral).
MS-DS 3	Communicate effectively within the field of data analytics (written).
MS-IT 1	Design, implement and evaluate network security and encryption protocols.
MS-IT 2	Recall, recognize and identify integral components of computer-based information systems.
MS-IT 3	Create valid software models using well-defined software modeling languages and design principles.
PhD 1	Apply broad, fundamental and in-depth knowledge of computer science to make a new contribution to the field.
PhD 2	Communicate effectively within the field of computer science (oral).
PhD 3	Communicate effectively within the field of computer science (written).

** is a wildcard, i.e. B* means this outcome is used across all Bachelor's degrees.*

*When referencing an outcome in the Course Outcomes section, please reference it by ID (i.e. B*2 or MS-CS 1).*

Reference: ABET Topics

ABET enforces that a certain set of topics be covered by an accredited degree, with a specific number of credit hours.

Some topics are general, and applicable across all or multiple accredited computing degrees:

TECH	All BS	Techniques, skills and tools necessary for computing practice
SEC	All BS	Principles and practices of security and privacy in computing
IMP	All BS	Local and global impacts of computing solutions on individuals, organizations, and society
PROJ	BS-CS, BS-DS and BS-IT	Major project (requires integration/application of knowledge in earlier coursework)
ADV	BS-CY, BS-DS and BS-IT	Advanced topics that build on fundamentals
SWEG	BS-CS and BS-IT	Software development
NTWK	BS-CS and BS-IT	Network and communication
INFO	BS-CS and BS-IT	Information management

Some are specific to each computing degree. These are broken down below.

BS-CS

ALG	Algorithms and complexity
THEO	Computer science theory
PL	Concepts of programming languages
GPL	General-purpose language
ARCH	Computer architecture/organization
OS	Operating systems
PAR	Parallel and distributed computing
CBS	Computing-based systems

BS-CY

CROSSCUT	Cross-cutting concepts (confidentiality, integrity, availability, risk, adversarial/systems thinking)
DATA	Data security
SW	Software security
COMP	Component security
CONN	Connection security
SYS	System security
HUMAN	Human security
ORGZ	Organizational security
SOC	Societal security

BS-DS

ACQ	Data acquisition and representation
MGMT	Data management
PREP	Data preparation and integration
ANAL	Data analysis
MODEL	Model development and deployment
VIZ	Visualization and communication of knowledge obtained from data
ETHICS	Data ethics (legitimate use, algorithmic fairness)
GOV	Governance (privacy, security, stewardship)
MATH/STAT	Applied stats/math (inference, modeling, linear algebra, probability, optimization)
COMP	Computing (including data structures and algorithms)
APPL	At least one application area

BS-IT

INFO	Information management
INTEG	Integrated systems
PLAT	Platform technologies
PDGM	System paradigms

UE	User experience design
WEB	Web and mobile systems
EXP	Experiential learning appropriate to the program

When referencing an outcome in the Course Outcomes section, please reference it by ID (i.e. TECH or SWEG).