



UNIVERSITY OF DHAKA

Department of Computer Science and Engineering
Faculty of Engineering and Technology (FoET)
Second Science Complex, Mokarram Bhaban Area
University of Dhaka, Dhaka 1000, Bangladesh

Course Outline

1 Basic Information

Faculty	Faculty of Engineering and Technology (FoET)
Department	Department of Computer Science and Engineering
Programme	Bachelor of Science in Computer Science and Engineering
Semester	3rd year 1st semester 2023
Course Code	CSE 3101
Course Title	<i>Computer Networking</i>
Course Credit	3.0 units
Contact Hours Per Week	3
Course Status	Core Course
Prerequisite Course	CSE 2203 - Data and Telecommunication

2 Course Teacher

Section	Name	Office	Email
1	Prof. Dr. Md. Abdur Razzaque	Room 422	razzaque@du.ac.bd

3 Class Hours

Section	Room	Weekday	Time	Weekday	Time
1	Room 420	Monday	08:30 AM - 09:50 AM	Wednesday	08:30 AM - 09:50 AM

4 Counseling Hours

Section	Weekday	Time	Weekday	Time
1	Monday	10:00AM - 11:00AM	Wednesday	10:00AM - 11:00AM

5 Course Rationale

Computer networking refers to the practice of connecting computers and other digital devices together to share resources and exchange information. It involves the use of hardware and software technologies that enable communication between computers and other devices, whether they are located in the same physical location or are geographically dispersed. Computer networking has also played a crucial role in the development of distributed software systems, new technologies like cloud computing, edge computing, big data analytics, and the Internet of Things (IoT) have all benefited greatly from computer networking. Businesses are now able to gather and analyze enormous volumes of data, automate their procedures, and

make better choices faster thanks to these technologies. Thus, Computer Networking is a core course of the undergraduate degree program in Computer Science and Engineering, helping students to gather knowledge and skills on the detail operation technologies of the Internet.

6 Syllabus

Introduction to Computer Networks: Protocol layers, Network Performance metrics (delay, loss, throughput, jitter, etc.), Circuit switching and packet switching. **Application Layer:** Protocol overview of HTTP versions, FTP, SMTP, DNS, SNMP and P2P Networks. **Transport Layer:** Protocol overview of UDP and TCP, Reliable Data Transfer, Congestion Control, TCP Tahoe, TCP Reno, TCP New Reno, TCP CUBIC. **Network Layer:** Forwarding and Routing functions at the Data plane and Control plane, Functional components of a router, Overview of IPv4 and IPv6, IP Addressing, NAT, Link State and Distance Vector Routing Algorithms - RIP, OSPF and BGP, Software Defined Networking - OpenFlow Protocol and SDN controller functionalities. **Wireless Networks** Introduction to wireless networks, Types of wireless networks, Medium Access Control in Wireless Networks, Routing in Wireless Networks, Mobility and Mobile IPv6.

7 Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Apply the knowledge of sciences and engineering fundamentals to interpret the elementary concepts of various architectures, applications, protocols, and background processes dealing with networking architecture related problems.	PO1	Cognitive (C3)	40%	Please refer to SECTION 9 .
CO2	Analyze operational details of various protocols, related to application, transport, and routing layers to apply the specialist engineering knowledge to solve the complex networking infrastructure related problem.	PO2	Cognitive (C4)	50%	
CO3	Establish a reliable protocol while planning and designing network services infrastructure, to address networking-related problems and issues that ensure user Quality of Service (QoS) and Quality of Experience (QoE).	PO6	Affective (A4)	10%	

Legend:

CO: Course Outcome

PO: Program Outcome (**APPENDIX: A**)

LoBT: Level of Bloom's Taxonomy (**APPENDIX: B**)

8 Teaching Methods

The teaching methods for a Computer Networking course encompass a range of strategies that engage students with both theoretical concepts and practical applications. Here are the key teaching methods for such a course:

- Lectures and Theoretical Foundations: Engage students through interactive lectures using Power Point Slides and Whiteboards.

- Problem Solving Practices: Students will be asked to solve problems instantly after or before a class delivery to ensure continuous learning of the materials and enhancing problem-solving skills.
- Discussion and Peer Learning: Facilitate class discussions where students can share their insights, ask questions, and discuss challenges they encounter. Peer learning encourages collaboration and diverse viewpoints.
- Student Presentations: Have students present their learning capacity of new technologies and findings to the class. This develops their communication skills and allows them to showcase their insights.

9 Assessment Methods of COs

Assessment Method	CO1	CO2	CO3	Total
Final Exam	30%	40%		70%
Midterm Exam	10%	10%		20%
Assignment/Presentation			5%	5%
Attendance			5%	5%
Total	40%	50%	10%	100%

10 Topic Outline

Lecture	Selected Topic	Article	Problems
1-2	Networking and Socialization, sharing course administration and guidelines • What's the Internet? What's a protocol? Network edge, network core; Access net, physical media;	T	T
3	Internet/ISP structure; • Performance: loss, delay ; Protocol layers, service models • network modeling and fundamentals of network security	T	T
4-6	Principles of network applications: app architectures and app requirements; • Client-Server and Peer-to-Peer Applications • Web and HTTP Protocols - version 1.1, 2.1, 2.2, 3.0, • Web Caching, Cookies, and DASH Protocol • File Transfer Protocol (FTP) and Electronic Mail: SMTP, POP3, IMAP	T	T
7-8	Domain Name System (DNS): Architecture, database, operational records and DNS caches • P2P file sharing protocols, Socket programming with TCP and UDP	T	T
9-11	Transport layer services • Multiplexing and demultiplexing; • Connectionless transport: UDP, and Principles of reliable data transfer, Connection oriented transport TCP): segment structure, Principles of UDP Communications, UDP Checksum and Internet Checksum	T	T
12-15	Principles of flow control, connection management Principles of congestion control • TCP congestion control Algorithms: TCP Tahoe, TCP Reno, TCP New Reno, TCP CUBIC • Evolution of Transport layer functionality Problem solving on practical problems related to Application and Transport layer protocols	T	T

16-20	Introduction to Network Data layer functionalities: Forwarding, Connection setup; Virtual circuit and datagram networks; What's inside a router? Organization and functionalities of a router. • IP: Internet Protocol Datagram format, IPv4 addressing CIDR, sub and super netting • DHCP, NAT, and ICMP • IPv6 header format, changes compared to IPv4, Transition from IPv4 to IPv6, Tunneling, Security, etc	T	R
21-24	Network Control Plane Functionalities: Routing algorithms - Link state Routing, Distance Vector Routing and Hierarchical routing Algorithms • Routing in the Internet Autonomous Systems, RIP, OSPF, and BGP fundamentals • Generalized Forwarding and Software Defined Networking, SDN Control plane, Open Flow Protocol, Interaction between data and control planes of SDN	T	T
25-26	Introduction to Wireless and Mobile Networks • Elements of a wireless network; Wireless Link standards and their characteristics; CDMA; • IEEE 802.11a/b/g systems; IEEE 802.11 MAC Protocol CSMA/CA; CSMA/CA with RTS/CTS; Cellular network architecture 4G, 5G and beyond systems.	T	T
27-30	Reviews, Future Internet and its Challenges • Problem solving practices, • Assignments/Presentations, etc.	T	R

For the definitions of **T** and **R**, Please refer to Section 11.

11 Text and Reference Materials

T Textbook:

- J. F. Kurose and K. W. Ross, **Computer Networking: A Top Down Approach**, 8th Edition, Pearson Publications, 2020.

R References:

- Andrew Tanenbaum & David Wetherall, **Computer Networks**, First Edition, Pearson, 2010.

12 Grading Policy

Marks Obtained	Letter Grade	Numerical Evaluation	Definition
80% and above	A+	4.00	Excellent
75% <80%	A	3.75	Excellent
70% <75%	A-	3.50	Very Good
65% <70%	B+	3.25	Good
60% <65%	B	3.00	Good
55% <60%	B-	2.75	Good
50% <55%	C+	2.50	Average
45% <50%	C	2.25	Average
40% <45%	D	2.00	Below Average
below 40%	F	0.00	Failing

13 Additional Course Policies

1. **Materials and Equipment:** To actively engage in classroom activities, it is essential that you bring your own supplies such as calculators, notebooks, and pens. Kindly refrain from borrowing materials from your peers during class, as this could lead to distractions for your fellow classmates.

2. **Assignments:** Throughout the course, a series of assignments will be assigned for the purpose of ongoing assessment. The cumulative average of your assignment scores will be utilized in calculating your final grade. Please note that late submission of assignments will result in a zero score for that assignment.
3. **Examinations:** Both the midterm and final examinations will be conducted as closed-book, closed-notes assessments. It is important to adhere to the no-mobile-phone policy within the examination hall. Please bring a non-smart wristwatch to assist in keeping track of time during the exam.
4. **Test Attendance Policy:** In the event of missing a test, it is imperative that you notify the instructor beforehand. Failure to do so will result in a zero score for the respective test. Since there will be no opportunities for makeup tests, please ensure your attendance for the scheduled assessments, as the scores from both class tests will contribute to your final grade.
5. **Use of Mobile Devices:** Extensive research indicates that the presence of multitasking devices, such as laptops and smartphones, can impede the learning process in a classroom setting. Thus, to optimize the learning experience, the utilization of such devices is strongly discouraged. Kindly power off your laptops and mobile devices during class activities to create an environment conducive to learning. Your cooperation is greatly appreciated.
6. **Participation and Engagement:** Actively participating in class discussions and activities contribute to a richer learning experience. Feel free to ask questions and engage with the material during lectures and group activities.
7. **Academic Integrity:** Uphold the principles of academic integrity by submitting your own original work for assignments, tests, and exams. Plagiarism and cheating will not be tolerated and may result in serious consequences.
8. **Communication:** Should you have any questions or concerns about the course content, assignments, or policies, please do not hesitate to reach out to the instructor via the designated communication channels.

Prof. Dr. Md. Abdur Razzaque
Course Teacher, CSE 3101
January 14, 2024

Prof. Dr. Saifudding Md. Tareeq
Chairman, Dept. of CSE, DU
January 14, 2024

Appendix A : Program Outcomes (POs)

POs	Category	Program Outcomes
PO1	Foundational Knowledge	Apply a profound understanding of mathematics, computational science, and the core principles of artificial intelligence and data science to tackle intricate challenges within the field effectively. Utilize theoretical insights and practical skills to devise innovative solutions.
PO2	Problem Analysis and Modeling	Identify, formulate, and rigorously analyze intricate problems in computer science and engineering domains. This involves extensive computing and scientific issues, literature review, and the application of mathematical, statistical, and computational techniques to derive substantiated conclusions.
PO3	Algorithm Design and Implementation	Design and implement advanced algorithms and computational methodologies for extracting meaningful insights from complex software, networks and hardware systems. Consider real-world implications, such as ethical considerations, privacy concerns, and societal impact.
PO4	Investigations	Skillfully explore and visualize intricate computing systems datasets to uncover patterns, trends, and insights that drive data-informed decision-making. Create meaningful visualizations that convey complex information effectively.
PO5	Modern Tool Usage	Apply a cutting-edge array of computing, communication and artificial intelligence techniques to develop innovative software application models, network systems and other AI applications. Understand model performance, fine-tuning, and interpretability.
PO6	Engineers and Society	Apply logical reasoning informed by contextual awareness to evaluate societal, ethical, legal, and cultural dimensions. Recognize the consequential responsibilities pertinent to professional data science practice within the context of these multifaceted considerations.
PO7	Environment and Sustainability	Understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics, responsibilities, and the norms of professional practice.
PO9	Individual Work and Teamwork	Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.
PO10	Communication	Communicate effectively about complex real-life problem-solving activities with the professional community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project Management and Finance	Demonstrate knowledge and understanding of the computation, software and network systems, and AI principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.
PO12	Life Long Learning	Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

Appendix B : Domain and Level of Bloom's Taxonomy

Cognitive Domain		Psychomotor Domain		Affective Domain	
C1	Remembering	P1	Perception	A1	Receive
C2	Understanding	P2	Set	A2	Respond
C3	Applying	P3	Guided Response	A3	Value
C4	Analyzing	P4	Mechanism	A4	Organize
C5	Evaluating	P5	Complex Overt Response	A5	Internalize
C6	Creating/Designing	P6	Adaption		
		P7	Origination		