University of Dhaka
Dept. of Computer Science and Engineering
Professional Masters in Information and Cyber Security (PMICS) Program

COURSE OUTLINE

1 General Information

Course Title:	(CSE 801 Communication Protocols and Internet Architecture)		
Semester:	(1st Semester/July 2025)	**Credit Hours:**	3
Instructor:	(Prof. Dr. Md. Abdur Razzaque)	**Email:**	(razzaque@du.ac.bd)
Co-Instructor:	(Mr. M. Shahadat Hossain)	**Email:**	(mshossain73@yahoo.com)
Class Location:	(Auditorium/Room 707)	**Class Day/Time:**	(Fri/6pm - 9pm)
Google Classroom Code:		xeed2iow	

2 Course Contents

Design, analysis, and implementation of networks and protocols: Internet Architecture Performance Parameters, TCP/IP, TCP Tahoe, TCP Reno, TCP New Reno, TCP CUBIC, Network Address Translation (NAT), Dynamic Host Configuration Protocol (DHCP), Internet Protocol Security (IPsec), Internet Control Message Protocol (ICMP), IPv4 and IPv6, Concepts of routing (Bellman-Ford and Dijkstra algorithms), Open Shortest Path First (OSPF), Interior Gateway Routing Protocol (IGRP), Enhance Gateway Routing Protocol (EIGRP), and Border Gateway Protocol (BGP), Software Defined Networking, Virtual Network Function, OpenFlow Protocol and Network Function Virtualization. **Application layer protocols:** Domain Name System (DNS), Simple Mail Transfer Protocol (SMTP), HTTP 1.0 to HTTP 3.0, Cookies, Webcaching, Proxy, Content Distribution Network, Bit Torrent, DASH Protocol, multimedia protocols for voice and video. **Design and Analysis of Networks**: LAN architecture and design, internetworking using switches and routers, the design and analysis of both private networks Internet, Zero trust network architecture. Network quality of service, voice and video on the Internet, policy-based networks, and Introduction to Wireless Networks - IEEE 802.11 Wireless LAN, Adhoc and Infrustructure mode networks protocols.

3 Course Learning Outcomes

A successful CSE 801 student should be able to:

- **CO1**: Interpret the operational concepts of various network and Internet architectures, applications, protocols in layers 3 to 5, and their design issues.

- **CO2**: Analyze security and user application service performances of the various Internet applications and communication protocols.
- **CO3**: Configure various communication protocols so as to meet diverse customer demands in terms of quality of service and security.
- **CO4**: Identify specific communication hardware and protocols at different layers while planning and designing a customized network service for a large-scale organization.

4 Course Material

4.1 Textbook and References

- (**Textbook**) James Kurose & Keith Ross, Computer Networking: A Top-Down Approach, 8th Edition, Addison Wesley, 2020.
- (**Reference**) B. A. Forouzan, Data communication and Networking., 4th Edition, Science Engineering & Math Publications, 2013.
- (**Reference**) Andrew. S. Tanenbaum, & D. J. Wetherall, Computer Networks, Seventh Edition, Dorling Kindersley, Pvt Ltd, 2008

4.2 Power Point Slides

For each of the theory and lab classes, a separate set of slides will be shared with the students through Google classroom.

4.3 Google Classroom

The following Google classroom https://classroom.google.com/c/ODA3NjEyMzEzODc5 will be used to share study materials and manage assignments and / or term papers. This will also serve as an online communication platform between instructors and students.

5 Lecture Methods

The theoretical knowledge and technical skills development activities for the students of this course will be conducted through classroom teaching on site and laboratory exercises. For the theory classes, the major teaching tools will be power point slides, whiteboard and marker, Kahoot, and mentimeter. The students must be ready to participate in discussions for problem-solving, case studies in a group and give presentations, etc.

For the network design and analysis, we will use the GNS3 network simulator or EVE-NG. And for demonstrating network services and application layer protocols, we will use mainly open-source tools built into Ubuntu or Kali Linux. The lab will be set up in a virtual environment running VMWare Workstation or Virtual Box. All necessary ISOs and Installer packages will be available on every machine in the Lab.

6 Lecture Delivery Plan

Weeks	Selected Topics	Source	Remarks
1	• TCP/IP Protocol stack, Functions of 5 layers • Concepts of socket, HTTP, Cookies, Web Caching	Textbook - pp. 1-18, 35-52	(AR) Student's prior knowledge will be assessed.
2	• Operations of DNS, SMTP, POP3, IMAP, and FTP • Multimedia Streaming, DASH and CDN	Textbook - pp. 123-146	(AR)
3	• LAB 1 DNS Concept, Implementation, DNS and Name Resolution, Role of DNS in Internet communication, Structure of World-Wide DNS Implementation.	Hands on Lab,Hands on PPT and Lab Manual	(MSH, AR, SBE)
4	• TCP and UDP - Congestion and Flow Control • TCP Tahoe, TCP Reno, TCP New Reno, CUBIC	Textbook - pp. 182-198, 227-263	(AR) A quiz test will be conducted, 15 marks, 30 minutes duration
5	• Destination-based and Policy Based Forwarding, SDN, OpenFlow Controller • IPv4, NAT, DHCP, IPv6, ICMP and IPSec	Textbook - pp. 303-309, 330-364	(AR)
6	MID TERM 1 EXAM	Syllabus will be declared in the class	(AR, MSH) Written, 30 marks, 1.5 hours duration
7	Mid term examination of other courses		
8	• LAB 2 HTTP protocol and its Capabilities,Concept of Web Server, HTTP Protocol, HTTP Methods, virtual hosting, status code, Secure HTTP. .	Hands on Lab, Hands on PPT and Lab Manual	(MSH, SBE)
9	• LS and DV routing, OSPF and BGP Routing Protocols • SDN, MiddleBoxes and Network Function Virtualization.	Textbook - pp. 378-395	(AR)
10	• LAB 3 SMTP Protocol and it's implementation, Concept of basic SMTP Server, Interactive communication with an SMTP Server, Prevent phishing and spoofing.	Hands on Lab, Hands on PPT and Lab Manual	(MSH, SBE)
11	• IGRP and EIGRP Protocols • Zero-trust network architecture	(MSH, AR, SBE) An assessment on laboratory-based case study problem solution will be conducted, 15 marks, 30 minutes	
12	• A secured network design architecture, and protocol suite • Private and public network design and analysis	Textbook, PPT and Assignment	(MSH, AR, SBE)
13	• LAB 4 IP Addressing, Subnet Mask, Wildcard mask, Subnetting, Supernetting, IPv6 Basic. • LAB 5 on Routing (Static, Dynamic, Redistribution)	Hands on Lab, Hands on PPT and Lab Manual	(MSH, SBE)
14	• MID TERM 2 EXAM • LAB 6 on SDN (SDN Controller,mininet, IP Block, Links, SDN Environment, Hands on PPT and Lab Manual)	Syllabus will be declared in the class	(MSH, AR, SBE) Practical Assesment, 30 marks, 1.5 hour
15	• IEEE 802.11 Wireless LANs, Bluetooth Network • Architecture and Protocols for Personal Area Network, Wireless LAN and Adhoc Networks, 4G/5G, LTE	Textbook - pp. 532-575	(AR)

Table 1: Weekly course content delivery and formative assessment plan

7 Student Evaluation and Grading

7.1 Student Evaluation

Diverse methods of assessment techniques are recommended to quantify the progressive learning and skill development of the students. While the summative assessment constitutes 50% of the total as the Final examination, the formative assessments weigh the rest half in different forms. A statement of the proportion that each evaluation component contributes toward the final grade is portrayed in Table 2.

Component	**Points**	**Remarks**
Class participation	5%	
Quiz/ term paper/ case presentation	15%	Two quizzes or 1 quiz and another term paper or case presentation will be conducted. The average of the two will be considered for assigning marks.
Midterm Exams	30%	• Two midterm exams will be held • Midterm 1 will be a written exam for 1.5 hours, carrying 30 marks • Midterm 2 will be on practical experiments for 1.5 hours, carrying 30 marks • Average of the two will be taken to assign midterm mark
Final Exam	50%	• 3 hours written Final exam will be conducted. • Question will be set by two examiners and moderation will be done by the examination committee. • Two examiners will examine the answer scripts and the average will be assigned as the given mark. • If marks of two examiners vary more than 20%, the third examiner's mark and its closer one will be averaged.

Table 2: Mark distribution for student performance evaluation

7.2 Grading

This course will be evaluated out of 100 marks including continuous assessments and final examinations. Following the grading policy of the University of Dhaka for regular undergraduate and graduate degree programs, grades of Professional Masters in Information and Cyber Security courses will be assigned according to the mapping in Table 3.

Numerical Scores	Letter Grade	Grade Point
80% and above	A+	4.00
75% to < 80%	A	3.75
70% to < 75%	A-	3.50
65% to < 70%	B+	3.25
60% to < 65%	B	3.00
55% to < 60%	B-	2.75
50% to < 55%	C+	2.50
45% to < 50%	C	2.25
40% to < 45%	D	2.00
Less than 40%	F	0.00
	I	Incomplete
	W	Withdrawn

Table 3: Letter grades and grade points

An 'I' (Incomplete) grade will be assigned to a student absent in the course's final examination for an acceptable reason. Such a student will be given a chance to sit for the makeup examination within two weeks of the last date of the final exam routine subject to approval of the course instructor and payment of prescribed fees.

A 'W' grade will be assigned to a student who withdraws himself (or herself) from this course in the middle of the semester.

8 Course Administration Policies

8.1 Class Participation

The University of Dhaka gives equal access to education for all students irrespective of their gender, ethnicity, nationality, age group, and disability status. Students are advised to bring their own materials such as a calculator, notebook, and pen to participate effectively in classroom activities. Borrowing from others inside the classroom is not allowed as it may potentially create distractions for their classmates. The use of mobile phones during class hours is strictly prohibited. An instructor has full right to defer the entrance of a late student in the class.

If your attendance count is 75% or above, you will be termed as a regular student; if it falls below 75% but above or equal to 60%, you will have to pay the prescribed fine to get admit card for the final examination; otherwise, you will not be eligible to sit for the final examination.

8.2 Missed Class Policy

Students are advised to attend all classes regularly. If circumstances occur missing a class, resulting in a student missing a quiz, presentation, lab test, or other graded item, the student must contact the instructor in advance by email or in person. The permission for sitting a make-up is subject to

the submission of valid official documentation by the student and getting its approval by the course instructor.

8.3 Makeup Exam

If the severe illness of a student (or first family members) occurs absent in the midterm or final examinations, the student will get a single chance (for each exam) to appear at the makeup examination subject to the production of official documentation and getting approval from the program conduction committee. In such cases, the student will deposit prescribed fees and collect admit card before the date of the examination.

8.4 Retaking a Course

a) Students with a grade of 'I', 'W' or 'F' in this course may retake the course offered in the subsequent available semester on payment of requisite fees.

b) The student has to pay the full tuition fee for the course unless he/she receives an 'I' in the course.

c) A student earning a grade of 'A-' or worse may also retake a course by paying the requisite fees to improve his/her grade in that course. However, in that case, the transcript will show credit, grade and R (Retake) against the retaken course.

d) A student will be allowed to retake a course only once. In order to retake a course, a student must apply to the program conduction committee at least 4 weeks before the commencement of the semester.

e) All retake applications must be approved by the program conduction committee. Any approval for retaking a course will result in auto cancellation of his/her earlier grade.

8.5 Academic Dishonesty

Any act of academic dishonesty including the adoption of unfair means in the examinations, copying from others, and submission of plagiarised term paper or case presentation or any designated report exercised by a student will result in an 'F' grade in the concerned course subject to the determination of the instructors.

8.6 Student Privacy

It is of utmost importance for instructors to uphold the privacy of individual students and not to influence their personal preferences. Instructors are prohibited from discussing a student's grades or class performance with anyone outside of the university faculty/staff without the student's written and signed consent. This includes parents and spouses.