CS5222: COMPUTER NETWORKS AND INTERNETS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Computer Networks and Internets

Subject Code
CS - Computer Science
Course Number
5222

Academic Unit
Computer Science (CS)

College/School
College of Computing (CC)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The aims of this course is to (i) introduce the fundamental concepts of computer networks using the TCP/IP Model as a framework; (ii) develop understanding in the structure, operation, and application protocols of the Internet. Specifically this course:
(i) introduces the concept of layered architecture in computer networks and the structure of the TCP/IP model;
(ii) covers the design issues in providing reliable transport of data in the lower protocol layers and the services provided in the higher layers;
(iii) examines the characteristics, technologies and current standards in local area networks;
(iv) covers the main protocol elements of the TCP/IP protocol suit;
(v) examines the structure, naming and routing aspects of the Internet;
(vi) examines some of the main Internet application protocols.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify and explain the fundamental technologies for the hardware and software of the internet.		x	x	x
2	Describe the conceptual and implementation aspects of network applications and its use in most of the application layer protocols such as HTTP, SMTP and FTP.		x	x	x
3	Investigate the implementation details on both reliable and unreliable services that can be provided by the transport layer protocol and to identify problems about the protocols.		x	x	x
4	Identify and make critique on the underlying principles of routing algorithms and its related protocols being applied to the Internet.		x	x	
5	Describe the services, principle and specific protocol provided in Local area network.		x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage with the basic concepts, design considerations and methodologies illustrated with case examples.	1, 2, 3, 4, 5	2 hours of lecture per week

2	Tutorial	Each week, students will engage in discussions and work on given problems related to the lecture topics.	1, 2, 3, 4, 5	1 hour tutorial per week
3	Protocol	Students will investigate and discover various different protocols using software protocol analyzer.	2	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments (Problem sets)	1, 2, 3, 4, 5	15	Allow GenAI to be only partially used: Students can only use GenAI for editing the English of the submitted document or brainstorming. However, GenAI cannot be used for other aspects, e.g., directly copying the AI-generated result and submitting it as the student's own work, which will be considered as academic dishonesty and students may face severe penalties. Students must understand their submitted work and be able to explain it.	Yes

2	Assignment (Hands-on experiments)	2, 3, 4, 5	10	Allow GenAI to be only partially used: Students can only use GenAI for editing the English of the submitted document or brainstorming. However, GenAI cannot be used for other aspects, e.g., directly copying the AI-generated result and submitting it as the student's own work, which will be considered as academic dishonesty and students may face severe penalties. Students must understand their submitted work and be able to explain it.	Yes
3	Research report	1, 2, 3, 4, 5	5	Allow GenAI to be only partially used: Students can only use GenAI for editing the English of the submitted document or brainstorming. However, GenAI cannot be used for other aspects, e.g., directly copying the AI-generated result and submitting it as the student's own work, which will be considered as academic dishonesty and students may face severe penalties. Students must understand their submitted work and be able to explain it.	Yes

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

Assignment (Hands-on experiments) (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Capacity to perform hands-on experiments related to Internet fundamental technologies, including HTTP, Web browser, SSL, DNS, Trace Route, etc.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal

Assessment Task

Assignments (Problem sets) (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand conceptual knowledge on Internet fundamentals, especially those related to Transport Network Layer Fundamentals.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal

Assessment Task
Research report (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to research on a computer networking topic and write a report.

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal

Assessment Task
Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to understand conceptual knowledge on Internet fundamentals, especially those related to Transport Network, Link Layer and Wireless and Mobile Networks Fundamentals

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal

Assessment Task

Assignment (Hands-on experiments) (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Capacity to perform hands-on experiments related to Internet fundamental technologies, including HTTP, Web browser, SSL, DNS, Trace Route, etc.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal

Assessment Task

Assignments (Problem sets) (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to understand conceptual knowledge on Internet fundamentals, especially those related to Transport Network Layer Fundamentals.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal

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Research report (for students admitted from Semester A 2022/23 to Summer Term 2024)

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Ability to research on a computer networking topic and write a report.

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Ability to understand conceptual knowledge on Internet fundamentals, especially those related to Transport Network, Link Layer and Wireless and Mobile Networks Fundamentals

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(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal

Part III Other Information

Keyword Syllabus

Network architecture: layered architecture, service and protocols; Data transport services and protocols: elements of protocols, service specification; Local Area Networks: LAN topologies, medium access methods: CSMA/CD; LAN performance, access delays, throughput; LAN standards; Wide-area networks, network technologies, circuit, packet, cell switching; Routing algorithms, Internetworking, IP, routing in Internet, mobile IP; Transport layer issues: connection management, multiplexing, quality of service. TCP/UDP protocol suite; Congestion and flow control schemes; Socket communication, client-server communications; Domain name system; Application protocols, HTTP, SMTP, POP, SNTP.

Reading List

Compulsory Readings

	Title
1	Computer Networking - A Top down Approach featuring the Internet, 7th edition, 2017, by James F Kurose and Keith Ross, Pearson International Edition

Additional Readings

	Title
1	Computer Networking and the Internet, 5th edition, 2005, Fred Halsall, Addison Wesley, ISBN 0321263588