

TO: The Engineering Faculty
FROM: The Faculty of the Elmore Family School of Electrical and Computer Engineering
RE: New undergraduate course – 40863

The Faculty of the Elmore Family School of Electrical and Computer Engineering has approved the following new undergraduate course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

FROM (IF ALREADY OFFERED WITH TEMPORARY NUMBER):

N/A

TO:

ECE 40863 Introduction to Computer Networks

4 total credits; 3 credit lecture, 1 credit laboratory

ECE 32100 and (PHYS 27200 or PHYS 24100 or PHYS 25100 or PHYS 26100) and (MA 26200 or MA 26600 or MA 36600)

This course provides students with a proper grounding in the fundamentals of computer networking. The course will cover classic concepts such as Internet architecture, naming and addressing, routing, forwarding, reliability, flow control, congestion control, and socket programming. The later part of the course will introduce students to topics such as secure communication, router architecture, datacenter and software-defined network. The course will also provide students with a hands-on experience of building practical and efficient networked systems and applications through various programming labs

RATIONALE:

The previous version of ECE 46300 lacked any experience with programming based on course material. This new version will include programming labs to implement the concepts covered in class to build a real-world network. This experience will bridge the gap between the theory and the practice in our computer networks curriculum. Due to so many changes in this course, is being established as a new course and not processing as a modification.



Mithuna Thottethodi

Associate Head of Teaching and Learning

Professor of the Elmore Family School of Electrical and Computer Engineering

Link to Curriculog entry: <https://purdue.curriculog.com/proposal:32485/form>

ECE 40863: Introduction to Computer Networks

Fall 2024

1 Course Information

Course Number and Title: ECE 40863, Introduction to Computer Networks.

CRN: 57741

Section: 001

Campus: West Lafayette

Instructional Modality: Face-to-Face

Lecture Time: Mon, Wed, Fri, 2:30–3:20pm in BHEE 170.

Course Credit Hours: 4. Lecture 3 credits; Lab 1 credit (Arrange Hours)

Honors Contract: Yes

Prerequisites: ECE 36800 (Data Structures) and proficiency in C and Python.

Course Web Page: <https://web.ics.purdue.edu/~vshriva/courses/ece46300fa24/index.html>

Course Brightspace Page: <https://purdue.brightspace.com/d2l/home/1096319>

Course Piazza Page: <https://piazza.com/purdue/fall2024/ece46300/home>

2 Instructor(s) Contact Information

Instructor

[Vishal Shrivastav](#)

Assistant Professor of Electrical and Computer Engineering at Purdue University

Office: BHEE 334B, 465 Northwestern Ave., West Lafayette, Indiana 47907–2035, USA

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Office Hours: Wed 4–5pm in BHEE 334B

Teaching Assistants (TAs)

Shiyang Wang, *Graduate TA*

Office Hours: Thu 5–7pm in BHEE 209

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Pranav Srisankar, *Graduate TA*

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Hyeong Tae Kim, *Graduate TA*

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Office Hours: Tue 5–7pm & Thu 11am–1pm in BHEE 209

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Anish Laddha, *Undergraduate TA*

Office Hours: Wed 5–7pm in BHEE 209

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3 Course Description

The goal of this course is to provide students with a proper grounding in the fundamentals of computer networking. The course will cover classic concepts such as packet vs. circuit switching, Internet architecture principles, naming and addressing, routing, forwarding, reliability, flow control, and congestion control. The later part of the course will introduce students to more advanced topics such as router architecture, software-defined network, and datacenter network. The course will also provide students a hands-on experience of writing network applications through socket programming.

4 Course Topics

1. Packet vs. Circuit Switching
2. Internet Architecture Principles
3. Socket Programming
4. Network Performance Metrics
5. Data Link Layer – MAC Addressing, ARP, CSMA/CD, Switched Ethernet, MAC Learning, STP
6. Network Layer – IP Addressing, NAT, IP Forwarding, Distance Vector, Link State, BGP, DNS
7. Transport Layer – UDP, TCP Reliability, TCP Flow Control, TCP Congestion Control
8. Application Layer – Web, HTTP, TLS, HTTPS, HTTP/2, QUIC
9. Router Architecture
10. Datacenter and Software-defined Network

5 Prerequisites

Proficiency in C and Python and familiarity with basic data structures (ECE 36800).

6 Learning Resources, Technology, and Texts

1. **Required Material:** Lecture slides and practice problem sets on Brightspace.
2. **Additional Reading:** [Computer Networks: A Systems Approach \(5th edition\)](#), by Peterson and Davie, Morgan Kaufmann, 2011, Hardcover ISBN: 9780123850591, eBook ISBN: 9780123850607.

7 Learning Outcomes

A student who successfully fulfills the course requirements will have demonstrated:

1. an understanding of the architectural principles underlying the Internet design.
2. an understanding of the design of various layers in the network stack, including data link layer, network layer, transport layer, and application layer.
3. a familiarity with router architecture, software-defined network, and datacenter network.
4. an ability to implement distributed routing, forwarding, and reliability protocols.
5. an ability to implement network applications using socket interface.

8 Honors Contract

This course offers an Honors contract to aid students to go beyond the material of the regular course and to produce work that engages deeper learning. Students who sign up for the Honors contract will be required to complete **one** extra milestone in Lab 3 in addition to the regular coursework. The milestone under Honors contract will account for 5% of the total grade.

Any student is eligible to contract a course for Honors credit so long as his/her cumulative GPA is 3.00 or above. The student does not need to be in the Honors College.

Once an Honors contract is successfully completed in a “regular” course, the word “Honors” is added to the name of the course, and this is the version that goes on the transcript.

To opt for Honors contract, students must request a Grade Mode Change via myPurdue before the end of the 2nd week of classes in the semester (Aug 30, 2024).

9 Assignments and Exams

Programming Labs — 40% of the grade

	Regular	Honors
Lab 0: Setting up the Environment	0%	0%
Lab 1: HTTP Web Client	5%	5%
Lab 2: HTTP Web Server	15%	15%
Lab 3: Distributed Routing – Honors Milestone	10% –	5% 5%
Lab 4: Reliable Transport	10%	10%

Examinations — 60% of the grade

Lab 1 and Lab 2 will be in C while Lab 3 and Lab 4 will be in Python. All labs must be done individually with no collaboration allowed. No extensions will be granted for lab submissions as students will be given ample time to finish each lab. There will be 3 exams (2 midterms and 1 final) each carrying 20% credit. The syllabus for the exams will be non-cumulative, i.e., the syllabus for the next exam will not include topics covered in previous exams. All exams will be closed-book with no collaboration allowed. Barring extraordinary circumstances (serious medical situations or family emergencies, accompanied by verification and a prior notification to the instructor), no make-ups will be granted for exams. Students who are most active and helpful in answering questions on Piazza may receive bonus points.

Policy for Late Submissions

If a lab is submitted within 24 hours (1 day) after the deadline — 25% grade penalty.

If a lab is submitted within 48 hours (2 days) after the deadline — 50% grade penalty.

No submissions will be accepted beyond 48 hours (2 days) after the deadline.

Policy for Re-grade Requests

Students may submit re-grade requests for programming labs within 48 hours (2 days) after the grades are released. All re-grade requests must be submitted on Piazza as a private post with the title “Re-grade request for Lab [X]” followed by a justification for the re-grade request (without a justification, the request will be ignored). Any emails sent to the TAs or the instructor about the re-grade requests will also be ignored.

10 Course Schedule

Week	Dates	Topic	Lab
1	Aug 19 – Aug 23	Course Introduction Packet vs. Circuit Switching Internet Architecture Principles I	
2	Aug 26 – Aug 30	Internet Architecture Principles II Socket Programming I Socket Programming II	Lab 0 release
3	Sep 2 – Sep 6	Labor Day Holiday Network Performance Metrics Data Link Layer I	Lab 1 release
4	Sep 9 – Sep 13	Data Link Layer II Data Link Layer III Data Link Layer IV	Lab 1 due
5	Sep 16 – Sep 20	Data Link Layer V Midterm Exam 1 Revision Network Layer I	Lab 2 release
6	Sep 23 – Sep 27	Midterm Exam 1 Network Layer II Network Layer III	
7	Sep 30 – Oct 4	Midterm Exam 1 Recap Network Layer IV Network Layer V	
8	Oct 7 – Oct 11	Fall Break Network Layer VI Network Layer VII	Lab 2 due
9	Oct 14 – Oct 18	Network Layer VIII Network Layer IX Transport Layer I	Lab 3 release
10	Oct 21 – Oct 25	Transport Layer II Transport Layer III Transport Layer IV	
11	Oct 28 – Nov 1	Midterm Exam 2 Revision Midterm Exam 2 Transport Layer V	
12	Nov 4 – Nov 8	Midterm Exam 2 Recap Transport Layer VI Transport Layer VII	Lab 3 due
13	Nov 11 – Nov 15	Application Layer I Application Layer II Router Architecture I	Lab 4 release
14	Nov 18 – Nov 22	Router Architecture II Router Architecture III	Lab 4 due
15	Nov 25 – Nov 29	Thanksgiving Break	
16	Dec 2 – Dec 6	SDN and Datacenter Network Final Exam Revision	
17	Dec 9 – Dec 13	Final Exams Week	

11 Grading Scale

The breakpoints for letter grades is shown below. Typically the final letter grade for a student will be based on their raw cumulative score at the end of the semester (normalized to 100 while accounting for the weight of each assignment and exam). However, the final raw score may be “curved up” to adjust for the difficulty level of assignments and exams, resulting in a potentially better final letter grade. For example, a raw score of 74 (B–) for a student may be curved up to 78 (B) to adjust for the difficulty level. The adjustment factor will be decided by the instructor at the end of the semester, and will be uniformly applied to each student’s final raw score. Raw scores will never be “curved down”.

Letter Grade	A+	A	A–	B+	B	B–	C+	C	C–	D+	D	D–	F
Score (out of 100)	95+	90+	85+	80+	75+	70+	65+	60+	55+	50+	45+	40+	≤40

12 Attendance Policy

This course follows the [University Academic Regulations regarding class attendance](#), which state that students are expected to be present for every meeting of the classes in which they are enrolled. Attendance may be taken at the beginning of a class and lateness may be noted. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification is not possible, the student should contact the instructor as soon as possible by email. For absences that do not fall under excused absence regulations (see below), this course follows the following procedures:

1. Student should not come to class if they are feeling ill, but they **MUST** email the instructor with the subject line: [course code] absence. The instructor does not need details about the student’s symptoms. The student should just let the instructor know that they are feeling ill and cannot come to class. If it is an emergency situation, the student should follow the University regulations on emergent medical care (see below).
2. Unless it falls under the University excused absence regulations (see below), any work due should be submitted on time via the course Brightspace.
3. If that day’s class involves assessed work such as a test or presentation, student and the instructor will plan if and how the student can make up the work, following the assignment guidelines. This plan must be done before the next class period, so again, the student should email the instructor immediately when they know that they will miss class.
4. The most important consideration in any absence is how it will affect the student’s achievement of the assignment objectives and the course learning outcomes.

For cases that fall under excused absence regulations, the student or their representative should contact or go to the [Office of the Dean of Students \(ODOS\) website](#) to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted by ODOS for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent medical care. The processes are detailed, so the student should plan ahead.

13 Academic Integrity

Unless expressly allowed, students are expected to complete all exams and programming labs by themselves. **No use of AI tools is allowed for completing the programming labs and exams.** However, students are allowed to discuss general issues with other students (programming techniques,

clearing up confusion about requirements, etc.). Students may discuss particular algorithmic issues on Piazza (but they must not post or copy code!). If there is any doubt, students should contact the instructor. Course staff will be using software designed to catch plagiarism and use of AI tools in programming labs and copying on exams. A student is considered in violation of the academic honesty policy regardless of whether they are the one “copying” or the one “being copied from”. Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on the course Brightspace under “University Policies and Statements”. Punishments for academic dishonesty are severe, including receiving a failing grade in the course or being expelled from the university. By departmental rules, all instances of cheating will be reported to the Dean of Students. On the first instance of cheating on a programming lab or exam, students involved will receive a 0; the second instance of cheating will result in a failing grade in the course.

Use of Copyrighted Materials: All course materials, including lecture slides, practice problem sets, programming labs, examinations, and solutions are subject to Purdue’s copyright policies. Students must not share, distribute, or post any material on an online website without checking with the instructor.

14 Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on the course Brightspace table of contents, under “University Policies and Statements”.

15 Accessibility

Purdue University strives to make learning experiences as accessible as possible. If a student anticipates or experiences physical or academic barriers based on disability, they are welcome to let the instructor know so that they can discuss options. Students are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

16 Mental Health/Wellness Statement

If a student finds themselves beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, they should try [Therapy Assistance Online \(TAO\)](#), a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the [TAO Connect website](#), or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools.

If a student needs support and information about options and resources, they should contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are Mon–Fri, 8am–5pm.

If a student finds themselves struggling to find a healthy balance between academics, social life, stress, etc., they should sign up for free one-on-one virtual or in-person sessions with a [Purdue Wellness Coach at RecWell](#). Student coaches can help students navigate through barriers and challenges toward their goals throughout the semester. Sign up is free and can be done on BoilerConnect. Students in Indianapolis will find support services curated on the [Vice Provost for Student Life website](#).

If a student is struggling and needs mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If a student or someone they know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in [West Lafayette](#) or [Indianapolis](#).

17 TaskHuman Service

TaskHuman offers private, real-time, on-demand, 1-on-1 video calls with wellness coaches covering over 800+ topics such as anxiety, mindfulness, reducing stress, clean eating, time management, in-home workouts, relationship tensions, financial issues, spiritual guidance and many more. Students can access these wellness coaches from around the world 24/7. The College of Engineering has an exclusive agreement with TaskHuman which gives students FREE and UNLIMITED access to these resources. Learn more at: <https://engineering.purdue.edu/ECE/TaskHuman>.

Download TaskHuman



Scan the QR Code to download the TaskHuman App or download the TaskHuman App directly from the App Store or Google Play Store. Create an account – Go to Setting and tap on “Check for Discounts”, Insert the code: **purdue63**. Don’t see a topic you want or have other questions? Contact Brooke Parks, Senior Lecturer in ECE, at brookeparks@purdue.edu

18 Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students Mon–Fri, 8am–5pm.

19 Emergency Preparedness

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor’s control. Relevant changes to this course will be posted onto the course web page and Piazza or can be obtained by contacting the instructor via email. Students are expected to check the course web page and Piazza, and read their @purdue.edu email on a frequent basis.

A link to Purdue’s information on [Emergency Preparation and Planning](#) is located on the course Brightspace under “University Policies and Statements”. This website covers topics such as Severe

Weather Guidance, Emergency Plans, and a place to sign up for the Emergency Warning Notification System. Students are encouraged to download and review the *Emergency Preparedness for Classrooms document (PDF) or (Word)*.

The first day of class, the instructor will review the **Emergency Preparedness plan for their specific classroom**, following Purdue's required [Emergency Preparedness Briefing](#). Students are advised to make note of the following items:

1. The location to where one will proceed after evacuating the building if one hears a fire alarm.
2. The location of the Shelter in Place in the event of a tornado warning.
3. The location of the Shelter in Place in the event of an active threat such as a shooting.