COURSE SYLLABUS

1. **ECE 4470 - Computer Networks**

2. **Meeting Information**
   4 credits, 5 contact hours (Two 75-minute lectures, one 2-hour lab per week)

   Section 001:
   Lecture: MW 1:50 pm - 3:05 pm, **Tol 427A** & https://villanova.zoom.us/j/92171994526
   Lab: Tue 4:30 pm - 6:20 pm, ZOOM: https://villanova.zoom.us/j/5501866845

   Section 002:
   Lecture: MW 3:25 pm - 4:40 pm, **Tol 427A** & https://villanova.zoom.us/j/95914462191
   Lab: Tue 1:30 pm - 3:20 pm, ZOOM: https://villanova.zoom.us/j/5501866845

3. **Course Instructors, TA**
   a. Class Instructor (sections 001 & 002): Dr. Sarvesh Kulkarni
   Office Hours: MW 11:30 am - 1:00 pm, or by appt.
   ZOOM (office hrs only): https://villanova.zoom.us/j/92485409553

   b. Lab Instructor (sections 001 & 002): Dr. Jiafeng Xie
   Office Hours: Thu 2:30 pm - 4:30 pm, or by appt.
   ZOOM (office hrs only): https://villanova.zoom.us/j/5501866845

   c. TA 1 (sections 001 & 002): Mr. Pengzhou He (phe@villanova.edu)
   Office Hours: Thu 2:30 pm - 4:30 pm, or by appt.
   ZOOM (office hrs only): https://villanova.zoom.us/j/5501866845

   d. TA 2 (sections 001 & 002): Ms. Olivia Lajeunesse (olajeune@villanova.edu)
   Office Hours: Tue 12:30 pm - 1:30 pm, Wed 10:00 am - 11:00 am, or by appt.

4. **Textbook**
   L. L. Peterson and B. S. Davie, *Computer Networks - A Systems Approach, 5th ed.*, Morgan Kaufmann, 2012. ISBN: 978-0-12-385059-1.

   Thanks to Villanova's Affordable Materials Project (AMP), you can get it FREE HERE.

   The O'Reilly Media mobile app (iOS, Android & Amazon Fire) allows you to read the textbook online/offline and syncs your progress and highlighted material across devices. Printed physical copies are not free, however.

   a. Other Supplemental Materials: Class slides and notes (will be posted on Blackboard)

5. **Specific Course Information**
   a. Catalog Description
   ISO/OSI, TCP/IP reference models; data transmission, encoding, framing, error detection, stop-and-wait, sliding windows; CSMA/CD, Ethernet; bridges, spanning tree protocol; connectionless, connection-oriented and source routing, IP addressing, forwarding, VPNs; switching fabrics; ARP, DHCP, DV, OSPF, BGP, DNS.

   b. Prerequisites: ECE 1620; Co-requisites: None

   c. Required for B.S. Computer Engineering

6. **Course-specific Goals**
   a. At the conclusion of this course, students are expected to: Acquire a broad understanding of the principles of architectural design and operation of contemporary, wired, packet-switched computer networks; Be acquainted with the hardware, software and design tradeoffs in current-day networks; Understand how network protocols at different levels inter-operate with each other and their role in a much larger world-wide system; Be acquainted with the social, economic and cultural impacts of this world-wide system; Learn the use of common network analysis tools; Implement a simple but fully working protocol on Ubuntu Linux in C (or C++) using the gcc (or g++) open source compiler.

   b.

ABET Student Outcomes						
1	2	3	4	5	6	7
X		X	X		X	

   The above student outcomes are defined by the Accreditation Board for Engineering and Technology (ABET) as:
   1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
   3. an ability to communicate effectively with a range of audiences.
   4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
   6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. **List of Covered Topics**
   1. The ISO-OSI and the TCP/IP reference models for communication, functions of individual layers, data movement between layers, protocols and their relationship to layers.
   2. PHY data transmission: wired media and wireless media; basics of modulation; NRZ, NRZI, Manchester and 4B/5B encoding; the Nyquist and Shannon-Hartley theorems (without proof) and their application.
   3. Data link layer: framing; error detection using 2-D parity, checksum and Cyclic Redundancy Check (CRC); error recovery - stop-and-wait & sliding window protocol; CSMA/CD and case study of Ethernet; Learning bridges and Spanning Tree Protocol (STP).
   4. Network layer: virtual circuits, datagrams, source routing; intra-domain routing algorithms - Distance Vector (DV), Open Shortest Path First (OSPF); inter-domain routing Border Gateway Protocol (BGP); IP addressing with classes, Classless Inter-Domain Routing (CIDR); IP subnets, masks, route lookups; switching fabrics and network processors
   5. Protocols - ARP, DHCP; Private communication - Virtual Private Networks (VPNs).
   6. Name resolution - Domain Name Service (DNS) architecture, records, and usage.
   7. Laboratory topic 1: Design/implement simple file transfer protocol over UDP by programming in C or C++ using gcc/g++ compiler on Ubuntu Linux.
   8. Laboratory topic 2: Network analysis tools - ping, route, traceroute, ss and wireshark

8. **Tentative Schedule**

   Separate document

9. **Grading Policy**
   A composite score (out of 100) will be computed by assigning weightages as follows.
   - Homework: 10% weightage
   - Quizzes: 20% total weightage
   - Midterm Exam: 20% weightage
   - Final Exam: 25% weightage
   - Laboratory: 25% weightage

   The final grading curve uses composite scores and will reflect a class average of B- or B, depending on the overall performance of the class. Regardless of the grading curve, a student with a compostite score of 90+ will be awarded an *A* grade while a student with a composite score of less than 50 will be awarded an *F* grade. *In addition, in order to pass this course, a student's aggregate lab score (i.e. the sum of all laboratory assignment scores) must be at least 50%.*

10. **HW Assignment and Laboratory Report Submission Policy**
    HW assignments and laboratory reports must be uploaded to **"Blackboard"** by the posted deadline. Late assignments/reports will be assessed a 10% penalty per day, up to the cut-off date (usually three days later). After the cut-off date, assignments/reports WILL NOT be accepted. You may turn in incomplete work to receive partial credit.

    You may work in groups and discuss your general solution approaches with others. However, you may not show each other your written solutions or share the details of your work.

    No laboratory sessions will be held for the first two weeks of the semester. Be sure to maintain a working Linux partition on your laptop with functional *C* and *C++* compilers (i.e. gcc & g++). And do backup your work - your grade depends on it!

11. **Examination Policy**
    The College of Engineering has adopted the following general examination guidelines:
    (a) Students must arrive before the start of the examination. Under exceptional circumstances a student may need to arrive late, but he/she can enter the examination room no later than 5 minutes after the start of the exam.
    (b) Cell phones must be turned off until the student exits the examination room.
    (c) The official Villanova class attendance policy must be followed when requesting excuses for absences or lateness to an examination.
    (d) Each student must sign the following statement, "I have neither given nor received any unauthorized assistance in the completion of this examination."

The Following Policies Are Mandated by the College/University

12. **Academic Integrity Policy** The College of Engineering is committed to creating an environment of academic integrity and ethical decision-making that we hope is reflected in the actions of our students and graduates. As Villanova students, integrity is central to the University mission. As engineers, our code of conduct requires us to place honor and integrity at the forefront of everything we do. As engineering students, it is expected that you will begin to adopt these values and instill them into your work habits. Students violating the academic integrity policy will receive a zero on that assignment or exam and the violation will be reported to the Associate Dean for Academic Affairs. The University's academic integrity policy can be found here: https://www1.villanova.edu/villanova/provost/resources/student/policies/integrity.html.

13. **Adherence to the Student Code of Conduct and the CARITAS Commitment**
Students are expected to act in a professional and respectful manner to their fellow students, faculty, and staff. Students should become acquainted with and understand the responsibilities set forth in the Student Handbook, especially those in the sections on Policy and Regulations. Adherence to university regulations is expected and required for successful completion of the program of studies. Enforcement within the classroom of policies regarding classroom behavior is the responsibility of the faculty member. All other discipline problems are to be referred to the Dean of Students.

    Students, faculty, and staff are expected to comply with the CARITAS Commitment. Students must wear masks, practice social distancing and good hygiene, wipe down their work area upon arrival and departure, and request an excused absence if they are not feeling well.

14. **Online Expectations**
To foster a professional environment, please wear appropriate clothes, mute if you are not talking to cut down on background noise, refrain from eating, and select an appropriate setting when we are meeting online.

15. **Students with Disabilities**
It is the policy of the university to make reasonable academic accommodations for qualified individuals with disabilities. If you are a person with a disability (non-physical) please register with the office of Learning Support Services (LSS) by emailing Learning.support.services@villanova.edu or by phoning 610-519-5176 as soon as possible. Registration is *required* in order to receive accommodations.

    The Office of Disability Services (ODS) collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The ODS provides Villanova University students with physical disabilities the necessary support to successfully complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact Gregory Hannah, advisor to students with disabilities at 610-519-3209 or visit the office on the second floor of the Connelly Center.

16. **The Learner's Studio**
Villanova's Learners' Studio provides free 1:1 and small group (maximum of 10 students) content tutoring for over 100 courses on campus (excludes writing, math, and entry level VSB courses). From quick homework clarification questions to prep for final exams, they can help! Their peer tutors are each endorsed by two faculty members and are trained according to CRLA national standards. Drop in as-needed or book a regular weekly session to supercharge

your academic success. Sessions can be 30 or 60 minutes in length. They are located in Old Falvey 301. Walk-ins are welcome, or you may book sessions online, in advance as follows.

(a) Visit Villanova.mywconline.com
(b) Register for an account and select "The Learners' Studio" from the drop-down menu on the sign-in page
(c) Use the "limit to" menu to locate your course by code (For example, PHY 2400). This feature will sort the schedule and show you all tutors approved to cover your class
(d) White boxes represent available sessions. Click any white box to book

If you don't see your class listed, request a tutor for a missing subject at: tutorrequest.villanova.edu For more information, contact juliana.studer@villanova.edu 610-519-5862.

17. **Electronics Policy**
The use of electronic devices, such as phones, laptops, tablets, etc., during class is generally fine, unless you become a disturbance to others. Students are prohibited from making any audio or visual recordings (including taking photographs) of lectures, discussions, or other classroom activities, unless a student (1) has written permission in advance from the instructor, or (2) is permitted to record under terms and conditions as approved by the University's Office of Disability Services or Learning Support Services. Students who have received approval to record classes as an academic accommodation must provide supporting documentation from the Office of Disability Services or Learning Support Services in advance of any recording. Students may use authorized recordings only for the purposes of individual study in the course, and may not disseminate or share them with a wider audience without explicit permission.

18. **Copyright Policy**
The materials used in Villanova University courses ("Course Materials") generally represent the intellectual property of course instructors, third parties and/or the university which may not be disseminated or reproduced in any form for public distribution (e.g., sale, exchange, etc.) without the written permission of the course instructor. Course materials include all written or electronic documents and materials, including syllabi, current and past examination questions/answers, and presentations such as lectures, videos, slides, etc., provided by a course instructor. Course materials may only be used by students enrolled in the course for academic (course-related) purposes.

Published course readings (book chapters, articles, reports, etc.) available in "Blackboard" are copyrighted materials. These works are made available to students through licensed databases or fair use. They are protected by copyright law, and may not be further disseminated or reproduced in any form for distribution (e.g. uploading to websites, sale, exchange, etc.) without the permission of the copyright owner.

Follow these links for more information on Intellectual Property, Copyright, and Computer Acceptable Use.

19. **Professorial Duties**
It is important to note that teaching is one of the many duties that professors perform as part of their job responsibilities. In addition to teaching, professors perform research, advise graduate students, edit journals and review journal articles, serve on committees for the university and professional societies, travel to conferences to remain abreast of current developments and to present their results.. to name just a few commitments.