# ECE 463 Introduction to Computer Networks

# Fall 2019

## Instructor:

Sanjay Rao
Associate Professor, ECE
Room 322A EE Building
sanjay AT ecn DOT purdue DOT edu

## Teaching Assistants:

Matthew Gaydos (gaydos@purdue.edu)

Ahmad Subhi Hasan Alawneh (aalawneh@purdue.edu)

**Instructor Office Hours:** Will be posted on Blackboard

**TA Office Hours:** Will be posted on Blackboard.

Please see the TAs for all programming project related questions, and questions where you need help figuring out issues with your code. Please see the instructor for more conceptual questions related to lecture, homeworks and exams.

## Lecture Location and Time

Tuesday and Thursday : Section 1: 9:00-10:15am, ME 1052
Section 2: 10:30am-11:45am, ME 1052

**Course Description:** This is an introductory class in Computer Networking. We will study the architecture, principles and design of the Internet, truly one of the most amazing inventions of recent times. Topics covered will include MAC layer design (Ethernet/802.11), the IP protocol, routing algorithms, TCP, congestion control and reliability, applications such as HTTP and video streaming. We will also discuss newer trends in networking such as security, and quality of service.

## Required Prerequisite:

(a) ECE 264 (Advanced C Programming).
(b) ECE 368 (Data Structures)

***Notes:***

(a) Strong proficiency in C programming is required given the heavy programming requirements and limited TA support.

(b) 368 was added as a pre-requisite after the Spring registration season and is not officially on the books (it will be for the next Fall offering). We will not enforce the pre-requisite this time, but strongly encourage you to defer taking this course to after you have taken 368 (463 will be offered again next Fall). Generally, students who have taken 368 do much better in 463 than those who have not. If you insist on taking it this time, please plan to work extra hard.

## Course Materials:

Required books:

1. Computer Networks - A Systems Approach, 5th Edition by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 2011

Recommended books:

1. UNIX Network Programming, Volume 1: The Sockets Networking API, 3rd ed by W. Richard Stevens et al.

## Syllabus:

1. Introduction and Overview
2. Data Link Layer
    1. Ethernet/802.11
    2. Bridging
3. IP Protocol
    1. Intra-Domain Routing
    2. Inter-Domain Routing
4. TCP Protocols
    1. Reliable data delivery
    2. Congestion Control
5. DNS
6. Applications
    1. Web applications
    2. Youtube and video distribution
7. IPv6 and NATs
8. Internet Security

## Learning Objectives and Assessment:

To pass the course, the student must demonstrate proficiency in each of the four course outcomes listed. The instructor reserves the right to make changes to the assessment criteria with adequate notice to the students.

i. an understanding of the fundamental principles underlying packet switching networks, and different Local Area Network technologies.

Criteria: Satisfactory Performance in Mid Term 1

ii. an ability to implement network protocols using network socket programming.

Critieria: Satisfactory Performance in Project I

iii. an understanding of the basic concepts of routing.

Criteria: Satisfactory Performance in Project II.

iv. an understanding of the key principles behind retransmission protocols, congestion control algorithms, and TCP

Criteria: Satisfactory Performance in TCP-related homework.

## Grading: [Tentative]

**Exact weights subject to change**

| | |
|---|---|
| Exams: | 55% |
| Mid Term I | 15% |
| Mid Term II | 15% |
| Final | 20% |
| Average of best 2 exams | 5% |
| Programming Projects: | 30-35% |
| Homeworks, Attendance, And Class Participation | 10-15% |

Notes: Just attending class will count for at most 5% of the grade, and it is possible no grade may be assigned for attendance at all. However, it may impact other factors as discussed later.

## IMPORTANT:

***To pass the class, irrespective of your performance in other areas, programming projects must be turned in and must demonstrate satisfactory effort levels to meet outcomes (ii) and (iii).***

## Grading Policy:

The breakpoints for letter grades will be decided by the instructor at the end of the semester adjusting for the difficulty level of the examinations. Normally, total scores of 90+ earn an A or higher, scores of 80+ earn B or higher, scores of 70+ earn C or higher, and 60+ earn D or higher. In deciding borderline cases, performance and regularity in homeworks, projects and class attendance and participation will be given significant consideration and greater weightage. Another factor is consistent performance in all examinations, or steadily improving performance over the course.

# Class Policies

**Attendance and class participation:** In resolving final grades for border-line cases, or when considering any policy exception requests from students, the student's track record in terms of attending class (including showing up in a timely fashion) may be taken into consideration. Formal attendance may not be taken on a regular basis, but the instructor may rely on his informal observations. Sign up sheets may also be passed around to track attendance.

**Programming Projects**: We will provide necessary background information for programming projects in class. Questions of a generic and conceptual nature will be answered. We expect that you have done your due diligence debugging your code using debuggers before approaching the TA. In general, TA time is limited, and we cannot spend a lot of time looking at your code and debugging it for you, beyond giving you some starting points. You should also expect that the TAs may be able to help you more if you start early and approach them with difficulties early. The help you can get closer to a deadline will likely get very limited given the large number of students. **Late submissions are strongly discouraged. They will only be considered under exceptional circumstances (e.g., extended period of sickness), will require that you contact me at least 2 days in advance, and may involve stiff penalties (including possibly receiving zero credit for grade assignment purposes, and only receiving credit for Pass/Fail purposes). Note that extensions even for Pass/Fail purposes will only be considered under rare and exceptional cases.**

**Homeworks:** In previous years, we have used paper-based homework. This year, we are in the process of moving to auto-gradeable Blackboard assignments. Expect an assignment every week. **No late submissions will be accepted for credit, regardless of reason (no exceptions). It is too high an overhead to administer late submissions, and each assignment will only be a small portion of the overall course grade. If you incur a serious illness with documentable evidence that you expect may last two or more weeks, get in touch with me as soon as medically feasible. I will review your overall attendance, and track-record in class, in deciding whether any consideration is possible.** When possible, some time will be given towards the end of a lecture for you to work on homework, which would also incent attendance. More detailed policies may be announced later. Given that we are transitioning to a new system, expect some changes along the way.

**Examinations:** Any conflict with the exam schedule needs to be brought to the instructor's attention in the first week. For emergencies that prevent attendance of a scheduled exam, you must present documentation confirming exceptional reasons beyond your control. You must also contact the instructor as soon as you become aware of the cause. The following are examples of insufficient reasons: non-emergency doctor visits, emergencies of persons other than immediate family members, job interviews scheduled after the first lecture.

**Campus Emergencies:** 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. In such an event, information will be provided through blackboard and/or through email. You are expected to check the course page on Blackboard, and read your @purdue.edu email on a frequent basis.

The Emergency Procedure Guide is here: Emergency Preparation Guide

Some specific recommendations/suggestions from the Provost's Office:

Specific building information is found in the Building Emergency Plan (BEP). The BEP is normally maintained by the Building Deputy. "Shelter in place" means that students should not leave the building when the outdoor sirens are sounded. Moreover, if the building fire alarms are activated, everyone must evacuate the building and should proceed to their emergency assembly area as specified in the BEP.

Updates and emergency information will be posted on Purdue's home page. Students are urged to sign up for emergency text alerts. Text message sign up procedures can be found at: http://www.purdue.edu/securepurdue/

See the University's website for additional information:
https://www.purdue.edu/ehps/emergency_preparedness/

**Academic Honesty:** Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

Cases of cheating or academic dishonesty may result in a lower grade, failure or action as per Purdue policies. Examinations will be closed book – any reference to material unless explicitly permitted by the instructor, or any help taken from or given to another student during an examination would be considered cheating. You may discuss project assignments with other students. Helping a fellow student debug a program, or providing tips and suggestions on programming assignments is perfectly fine and is in fact encouraged. However, the actual program or code must be written individually by each student, and not copied from another student. ***In a group project, each member of the group is expected to contribute significantly to the effort.*** A group member not doing their part may be penalized with a lower grade, or failure grade on a course learning objective.

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 that is submitted provides the greatest opportunity for the university to investigate the concern.

***Reusing (or adapting) material (e.g., reusing code) from a student who took the course in a previous year will also be considered a form of academic dishonesty.*** Please note that we have solutions submitted by students for many of the past years, and will be checking for code similarity with submissions from prior years using very effective tools.

**Use of Copyrighted Materials:** All material, including lecture material and notes, homeworks, project descriptions, examinations, and solutions are subject to Purdue's policies regarding commercial note taking. ***Please do not post any material on an online web site without checking with the instructor.*** More details about Purdue's policies may be found here: (See Part J):

http://www.purdue.edu/studentregulations/student_conduct/misc.html

"Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally. Notes taken in class are, however, generally considered to be "derivative works" of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose."

**Grief Absence Policy for Students**

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). Specifically, students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missing assignments or assessments in the event of the death of a member of the student's family.

See the University's website for additional information:
http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

**Violent Behavior Policy**
Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

See the University's website for additional information:
http://www.purdue.edu/policies/facilities-safety/iva3.html

**Students with Disabilities**
Purdue University promulgates policies and programs to ensure that all persons have equal access to its employment opportunities and educational programs, services and activities. The principal objective of this policy is to provide fair and consistent treatment for all students and employees of the University**.** The Disability Resource Center (DRC) ensures universal access to classes, programs and activities. Purdue has designated the DRC to determine reasonable accommodations for students with disabilities. Any academic accommodation must be arranged for by the student through Purdue's Disability Resource Center.

More information about the DRC may be found here:
https://www.purdue.edu/studentsuccess/specialized/drc/

**Nondiscrimination**
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. Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. You may want to refer students to Purdue's nondiscrimination statement:
http://www.purdue.edu/purdue/ea_eou_statement.html

**Calculator policy for examinations:** No calculators will be permitted in examinations

**Disclaimer**
This syllabus is subject to change. .