Course Syllabus

Course Overview

You use the Internet through your PC, laptop, smartphone, tablet, etc. In this course we cover the basics of how such a variety of devices can use a big range of technologies to connect seamlessly to each other. In the second half of the course we translate the basic knowledge of the protocols to more hands-on exercises in containerization (Docker) and at the end we give an introduction to Kubernetes, that is an open-source system for automating deployment and management of containerized applications.

Learning Outcomes

- Understand how a computer connects to a network, obtains an IP address, and communicates to local devices on the same network and use those devices to connect to computers on the Internet anywhere in the world
- Plan an IP address plan for a network, given the number of hosts for that network
- Be able to analyze packets using wireshark and identify different protocols used in a network
- How to use socket interface to develop client/server applications
- Understand containerization of software packages using Docker, build Docker images, and understand Docker networking
- Get a basic understanding of how Kubernetes uses containerized images to create a scalable, secure, manageable service using the basics of TCP/IP
- Deploy scalable applications in Kubernetes

Activities, Learning Assessments, and Expectations

There will be homework (every other week), a mid-term exam, and a final project.

Quizes (10%)

Homework (30%)

Homework will be given once every two weeks and is expected back the week after each homework is given.

Mid-term exam (30%)

Mid-term exam will be about half way through the course and will cover all the material covered up to that point.

Final Project (30%)

Either a Final exam will be given at the end of the semester, or a project will be given

Expectations:

It is expected that you will devote about 8-9 hours to this course each week, including the class time, studying to keep up with the class, doing the homework and project. Every effort has been made to evenly distribute the course requirements, and to support your understanding of the course material. However, it is likely that some weeks will require more effort on your part, and some material will require additional help beyond what is immediately available. Please reach out to me for these course-related questions, and please be prepared to put in the additional effort.

Your participation in class is expected, either in person, or remotely using the remote learning media.

Course Specific Policies

- Homework is due before class time on the day it is due. The solutions to the homework are given on the same day during class. So, any late homework will only get half of the points.
- Class participation is expected. If you are going to be absent, please let me know in advance.
- Any material distributed in class is for your use only and should not be shared or distributed outside of class.
- I try to respond to emails within 24 hours, but usually much faster.

Course Topics

1. Address Resolution Protocol (ARP)
2. Error and Control Messages (ICMP)
3. Internet Protocol (IP)
4. Classless and subnet addressing extensions (CIDR)
5. User Datagram Protocol (UDP)
6. Transport Control Protocol (TCP)
7. Internet Multicasting (IGMP)
8. Network Address Translation (NAT)
9. IPv6 Protocol
10. Domain Name Service (DNS)

11. Socket Programming
12. Application Development using Sockets
13. Containerization and Docker technology
14. Deploying Scalable Applications in Kubernetes