IT420 Advanced Computer Networks
Wednesday

Course Description

IT420 provides students with an understanding of methods, tools and technologies required to work with modern computer systems and networks. It includes a detailed discussion of Internet/intranet issues, including standards, connectivity, performance, protocols, network configurations, network design, and wireless technology, covering both hardware and software systems. Emerging technology topics include Virtualization, Automation, and Software Defined Networking. This course focuses on Networking theories and its practical applications.

Prerequisite: IT 120 Introduction to Network Technology

Instructor:	Tanisha Grayson
Office:	NA
Phone:	917-662-5908

Email: tgrayson@njit.edu **Please put IT420 and the course section in the subject of your email.** **I prefer you to contact me via the Canvas courseroom first for a faster response.**

Office Hours: See Canvas course information for standard open office hours, or by appointment

Text: A Practical Guide to Advanced Networking by Jeffrey S. Beasley – You can purchase the electronic version through VitalSource. The link for the site is https://www.vitalsource.com/educators/products/a-practical-guide-to-advanced-networking-jeffrey-s-beasley-piyasat-v9780133354003?term=9780789757494

Software: We will use *Cisco's Packet Tracer* and *Wireshark* program for virtual labs. (Installation process will be explained during Week 1)

Canvas: Additional material and resources will be found on the class website on Canvas, (https://canvas.njit.edu/). It will be modified and updated as the course progresses and will contain the most recent information.

Notes: Please bring your laptops to class every week. You will need Windows or Mac OS for Packet Tracer and other in class labs.

Schedule: *The following is a tentative schedule and subject to change.*

Day	Topics	Lab Activity
Week 1	**Class Introduction and Overview** - Layered Model Review - Network Communication Standards - Data Encapsulation / De-encapsulation - Calculating Overhead - TCP/IP Protocol Suite	Packet Tracer Setup & In-class Lab Review *Post Hmwk1* *Complete signup sheet for current events*
Week 2	**LANs and Ethernet** - MAC Addresses - Classic Ethernet - Modern Ethernet - Ethernet Media - Ethernet Switches	PT / Lab - View Network MAC Addresses
Week 3	**Advanced Ethernet** - Spanning Tree Algorithm - STP Operations - Virtual LAN (VLANs) - Inter-VLAN Routing	PT / Lab - Configuring Router-on-a-Stick Inter-VLAN Routing
Week 4	**Wireless LAN Concepts** - Components of WLANs - WLAN Operation - CAPWAP Operation - Channel Management - WLAN Threats -Secure WLANs	PT / Lab - Configure a Wireless Network
Week 5	**IPv4 Addressing** • - IPv4 Address Structure	PT / Lab - Subnetting Scenario

	• - Types of IPv4 Addresses • - Network Segmentation • - Subnet an IPv4 Network • - Subnet to Meet Requirements	
Week 6	**Routing Concepts** -Path Determination -Forwarding -Routing Table -Static and Dynamic Routing -Dynamic Routing Protocols	PT / Lab - Basic Routing Configuration Review
Week 7	**IPv6 Addressing & NAT for IPv4** • - IPv4 Issues • - Network Prefixes • - IPv6 Address Representation & Types • - NAT Characteristics • - Types of NAT • - Static & Dynamic NAT • - PAT	PT / Lab - Configure NAT for IPv4 **Study for Midterm Exam**
Week 8	**WAN Concepts** - Purpose of WANs - WAN Operations - Traditional WAN Connectivity - Modern WAN Connectivity - Internet-Based Connectivity	PT / Lab - WAN Concepts *Midterm*
Week 9	**Transport Layer** • -Transportation of Data • -TCP & UDP overview • -Port numbers • -TCP Communication Process • -Reliability and Flow Control • -UDP Communication • -Web and Email protocols • -IP Addressing Services • -File Sharing Services	Wireshark Lab - Observing the TCP 3-Way Handshake in Wireshark

Week 10	**Network Management Protocols** -Device Discovery with CDP & LLDP -NTP -SNMP -Syslog	PT / Lab - Configure Cisco Routers for Syslog, and NTP Operations
Week 11	**Network Troubleshooting** • -Network Documentation • -Troubleshooting Process • -Troubleshooting Tools • -Symptoms and Causes of Network Problems • -Troubleshooting IP Connectivity	PT / Lab - Troubleshoot Network Connectivity Issues
Week 12	**Network Virtualization** • Cloud Computing • Virtualization • Virtual Network Infrastructure • Software-Defined Networking • Controllers	PT - Explore the Smart Home
Week 13	**Break**	
Week 14	**Network Automation** • Automation Overview • Data Formats • APIs • REST • Configuration Management Tools • IBN & Cisco DNA Center	PT - Compare CLI and SDN Controller Network Management
Week 15	**Network Security Concepts** -Current state of Cybersecurity -Threat Actors -Malware -Common Network Attacks -IP Vulnerabilities & Threats -TCP & UDP Vulnerabilities -IP Services -Network Security Best Practices -Cryptography	PT - Communicating in a Cyber World

Week 16	**Exam Review**	**Study!**
	FINAL EXAM **NO MAKE UP EXAMS WILL BE GIVEN** **Final Exam – time and place to be announced**	

Note: Schedule may change. Refer to class web page for most recent information.

Credit: 3

Grades: Final grades will be based on:

Midterm	20%
Final	25%
Class participation	5%
Homework (5 assignments)	20%
Labs	30%
A	90 -100
B+	85 – 89
B	80 – 84
C+	75 – 79
C	70 – 74
D	60 – 69
F	0 - 59

I may curve up when assigning grades, but I will under no circumstances curve down. For example, you may earn an A if you have 898 points, but you will not earn lower than a B+ if you have 850 points. I will not assign incompletes unless there are extraordinary circumstances.

POLICIES:

Assignments (Homework and Labs)
Homework for this class consists of five homework assignments. Their purpose is to help you keep up with the material and assess your readiness for the midterm and final.

There will be one Lab per week, which we will start together on the second day of each week's class. You will be expected to complete the steps and Challenge/Reflection questions on your own.

All assignments are due before midnight (**11:55pm**) on the due date specified on the schedule. It will be submitted via Canvas electronically. Late homework will not be accepted unless there is a reason beyond your control. In most cases I try to grade homework online and return the results back to you electronically.

Class Preparation and Meetings

As with all college courses, you are expected to spend two hours outside of class for every hour in class, so plan to spend about 6 hours per week outside class.

PowerPoint notes and other resources will be available on the class Canvas page before each class. I expect you to do the assigned reading and review the notes *before* you come to class. You will get more out of the class if you have spent some time thinking about the material in advance. This course covers a lot of material quickly. Don't let yourself get behind!

Attendance is highly correlated with good performance in the class, so I will record attendance for every class. **More than three absences will affect your grade.**

Absences may be excused for athletics, religious holidays, illness, court, military obligation or family emergencies if you contact.

Participation

I expect you to **actively participate in class** by asking questions and to come prepared to answer questions in class. It is important to have read the material prior to class. You will achieve better learning if you've spent some time thinking about the material in advance.

I reserve the right to issue surprise quizzes at my discretion which will be included as part of the participation grade. This ensures you have done the readings and Labs and forces you to keep up with the material.

Makeup Tests and Assignments

Requests for makeup tests and assignment changes must be made in advance with the instructor and will only be approved if the reason is beyond your control.

Academic Integrity Policy

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf*.*

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at* dos@njit.edu*"*

All of your assignments must constitute original work. These assignments may **NOT** be done in collaboration with anyone else (unless otherwise approved). No credit will be given for any assignment that is copied—in part or in its entirety—from another person. **Both people involved will receive no credit.**

Note, however, that you may "talk" about assignments with each other, but such discussions must remain at a conceptual level. In summary, keep in mind:

- Do NOT ask to see another person's assignment, particularly a finished assignment.
- Do NOT pass your assignment around to other members of the class.
- Do NOT submit duplicate assignments. Even partially duplicate assignments will NOT be accepted.
- If the instructor is at all **uncomfortable about the originality of your work**, no credit will be given.
- Do NOT submit an assignment used for previous assignments in this or other courses.

TURNITIN Policy
NJIT uses Turnitin.com, a service that helps prevent plagiarism on student papers. I will be using the Turnitin.com service at my discretion to determine the originality of student work. If I submit your work to Turnitin.com, it will be stored by Turnitin.com in their database as long as their service remains in existence. If you object to this storage, **you must let me know no later than two weeks after the start of this semester.** Note, I may utilize other services and techniques to check for plagiarism.