Network Design Paper

UMUC has recently acquired a building in Frederick, Maryland. This new building will house some administrative offices, lecture rooms, library, and computer labs.
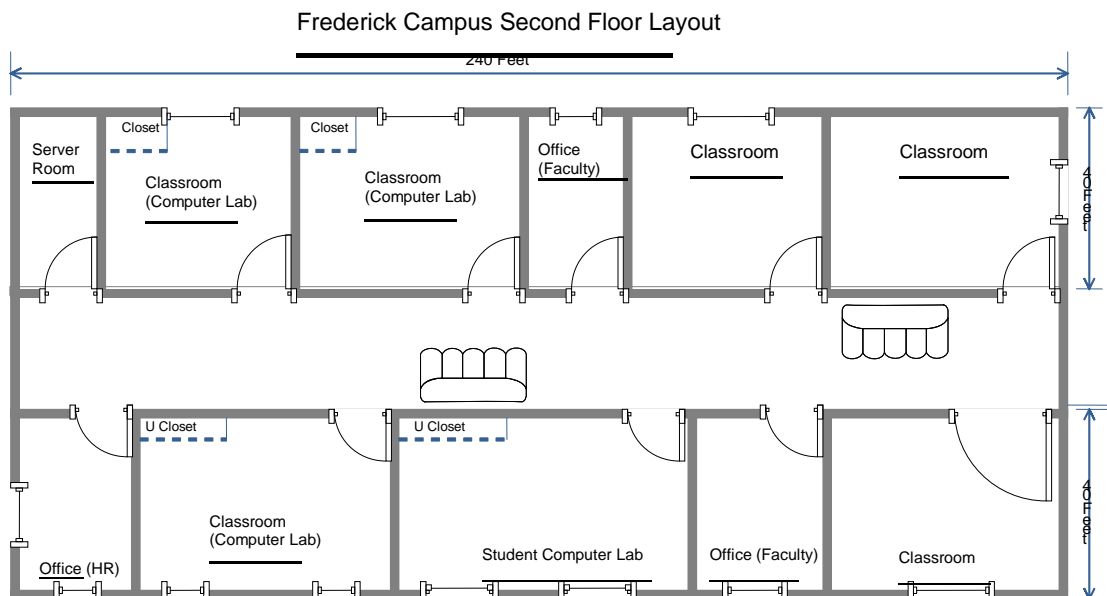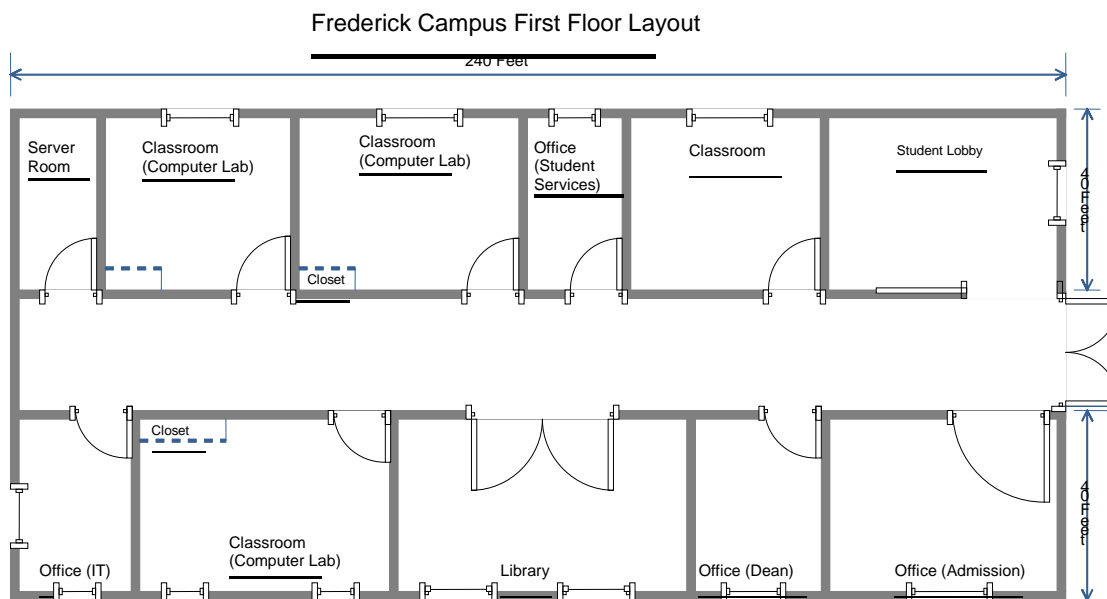
Building dimensions:
Length: 240 Feet
Width: 95 Feet
Height: 30 Feet

The 40-year-old two-story building has the following existing layout:

Frederick Campus First Floor Layout

Frederick Campus Second Floor Layout

There will be six computer labs that will be used for instruction. Each of these labs will have 21 computers (20 student computers and 1 instructor computer). Each of these labs will also have a server in the closet located inside the lab.

In addition to the six computer labs, there will also be a Student Computer Lab that will provide computer access to students to do their homework. There will be 30 computers in this lab and a server in the closet.

The library will also have some computers to allow students access to the library resources. There will be 10 computers for student's use in the library, and 5 computers for Library staff.

There are four lecture classrooms in the building. Each of this room will have a computer for instructor's use.

Finally, there are various offices in the building. Each of these offices will have one computer for the staff use, with the exception of the Admission office that will have 5 computers for staff use.

Equipment Inventory

Workstation Placement	Number of Workstations	Users	Total WS
6 Instructional Computer labs	21 WS	Student and Instructor	126 WS (based on 20 WS for students and 1 WS for instructor on each lab * 6 labs)
Student Computer Lab	30 WS	Student	30 WS
6 Various Offices	1 WS	Staff	6 WS
1 Admission office	5 WS	Staff	5 WS
Library	10 WS	Student	10 WS
Library	5 WS	Staff	5 WS
4 Instructional Classrooms	1 WS	Instructor	4 WS Total
Server	?	Staff	To be determined by students
Network Connecting Devices	?	IT Staff	To be determined by students
Printers	?	Staff	To be determined by student
Printers	?	Instructional	To be determined by student

Two server rooms have been allocated, one on the first floor and one on the second floor.

Your task is to design the network for this new building with the following criteria:
- Student-accessed computers should be on separate network from the staff-accessed computers. There should be at least 3 separate networks: Administrative, Instructional, and Public. All staff-accessed computers will be on the Administrative network. The computers in the instructional computer labs and classrooms that will be used for classes should be on the Instructional network. The wifi and the computers in the student lobby should be in the Public network.

- The whole building will share one Internet access connection (T-1 link from Verizon). This connection will come into the Server Room on the first floor. The Public IP address for the router here is 191.1.15.1
- Security is very important for UMUC as we have to protect students and employees data as well as any intellectual property that UMUC has on the servers and computers.
- The network has been assigned the 10.15.0.0 network address for all computers and devices.
- The network should use physical cable (not wireless), but do provide wireless access in the Student Lobby area.

Submission should include (in no more than three pages, excluding diagrams and references):

Network Addressing:
1. Define the subnet (based on: rooms, floor, department, or other criteria).
2. For each subnet, explain which devices/groups/users/rooms will be on this subnet, define the network address, subnet mask, and available IP addresses to be used by computers or devices.

Physical Network Design:
1. Define the topology that will be used.
2. Select the appropriate network media to use.
3. Select the appropriate network connecting devices to use.
4. Physical layout of the computers on the floor plan.
5. List of additional servers or network devices needed to implement the network.
6. Justifications for your network design (number 1 – 5 above)

You will be evaluated on your ability to

- Implement appropriate IP addressing scheme
- Select and justify appropriate cable media that includes the length of each cable segment and number of nodes on each segment
- Select and justify appropriate topology such as star, bus, or ring for your network
- Select and justify of your selected network equipments
- Select and justify appropriate network services to meet network requirements
- Select and justify security implementation for the network
- Use proper grammar, formatting, network terminology, and reference citations

Feel free to use any drawings or attachments, and assume any number of computers or users (not when provided here). You will be graded on the basis of right media, topology and knowledge of network concepts.

Grading Rubric

Criteria				
	0-59%	60-79%	80-89%	90-100%

IP Addressing 30%	Student fails to demonstrate adequate subnetting knowledge	Student demonstrates some knowledge of subnetting	Student demonstrates proper subnetting for the network but failed to provide all IP addressing information needed	Student demonstrates proper subnetting for the network and provide all IP addressing information needed
Network Requirement 40%	Student fails to design proper network to address the given scenario	Student misses some critical network design and/or misses on the justifications	Student designs a network that address most of the requirement and are able to justify some of the design	Student designs a network that met all requirements and are able to justify the design
Network Technical Knowledge 20%	Student does not have grasp of technical content.	Student lacks sufficient technical content but conveys basic understanding of concepts.	Student conveys technical content but fails to elaborate.	Student demonstrates full technical knowledge.
Grammar, Spelling, References and Organization 10%	Significant spelling errors, grammatical errors, and/or lack of organization make information very difficult to follow.	Misspellings, grammatical errors, and/or lack of organization make information very difficult to follow.	Essay has a few misspellings and/or grammatical errors but is fairly well organized.	Essay has insignificant misspellings or grammatical errors and is well organized.