Department of Information Sciences and Technology

Volgenau School of Engineering

IT 467 Network Defense

Fall 2021

**Common Syllabus** revised 8/24/2021

This syllabus contains information common to all sections of IT 467 for the Fall 2021 semester. Information specific to each section will be made available to registered students via the Blackboard course management system.

**University Policies**

The [University Catalog](#) is the central resource for university policies affecting student, faculty, and staff conduct in university affairs. Unless explicitly noted, any conflict between the policies in the University Catalog and the content of this document is unintentional. Please notify the author to resolve any such conflicts.

Please note that the Academic Year runs from the Fall semester of one calendar year through the Spring and Summer semesters of the following calendar year. Please be sure to select the correct archived Catalog if appropriate.

**Scheduled Sections**

<table>
<thead>
<tr>
<th>Section</th>
<th>Instructor</th>
<th>Campus</th>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Prof. Lyons</td>
<td>Science and Technology</td>
<td>Wednesday</td>
<td>7:20 – 10:00 p.m.</td>
</tr>
</tbody>
</table>

Access to Blackboard for each section will be made available no later than the day of the first class for that section.
Course Description

From the [University Catalog](#):

**IT 467: Network Defense.** 3 credits.

Practices and procedures for defending business-class, heterogeneous networks against threats (including system failure, environmental events, human error) and attacks (including intrusion, malicious software, denial of service). Through practical lab sessions, students receive real-world experience designing networks, installing and configuring system components, detecting and recovering from problems and attacks, and gathering data to support prosecution of offenders and refinement of countermeasures. Offered by [Info Sciences & Technology](#). Limited to two attempts.

Registration Restrictions:

**Required Prerequisites:** (IT 366<sup>C</sup> and 223<sup>B</sup>.

- <sup>C</sup> Requires minimum grade of C.
- <sup>B</sup> Requires minimum grade of B.

Enrollment is limited to students with a major, minor, or concentration in Applied Information Technology, Applied Science, Individualized Study, Information Technology or Info Tech Entrepreneurship.

Students with the terminated from VSE major attribute may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the [Undergraduate Regular scale](#).

Prerequisites

The required grades must be achieved in each prerequisite course **before** a student is qualified to take this course. The prerequisite courses must be completed prior to, not concurrently with, this course.

This requirement will be **strictly enforced**. Any student enrolled in the course who has not met the prerequisite requirements (or received a waiver) by the start of the semester will be dropped from the course and the student will be responsible for any consequences of being dropped.
Rationale

This course allows students substantial hands-on experience in network defense, complementing the study of network security theory and practice in IT 366 Network Security I and continued in IT 466 Network Security II. It is intended to satisfy student and employer demands for real-world practical experience that can be immediately applied in the workplace.

Lab work will be performed in small teams, each of which will be given a variety of servers and workstations running typical business software applications. Each team will be challenged to design and implement a network security infrastructure, then test it against real-world threats and attacks. Students must consider all possible threat types, including system failure, natural events, human error, and malicious attacks, any of which may originate outside the network or within it.

Students will learn a holistic approach to network security, from initial definition of requirements through design, implementation and testing of security practices and technologies, to on-going operation, maintenance and support activities. A protect/detect/react paradigm will be used to anticipate problems, attempt to defend against them, determine when defensive measures have failed, and take appropriate remedial action, including recovery and re-design. Students will learn how to collect and analyze data to enable early detection of problems, define requirements for system changes, notify support agencies (e.g. CERTs), and support law enforcement efforts to apprehend and prosecute criminal offenders.

The content is relevant to students currently or expecting to be working in information security in business, government (especially homeland security), and law enforcement, especially in network security, vulnerability assessment, and penetration testing. Target audiences include George Mason University students and employees of businesses and agencies in the region.

Supported Student Outcomes at the Program Level

This course supports the following student outcomes of the IT major:

2. The ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

4. The ability to recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

6. The ability to identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.
Objectives

On successful completion of this course, students will be able to:

– Examine and document the network architecture of an information system.
– Identify potential flaws in a network design and recommend and justify changes to it.
– Create, configure, and operate a variety of computing platforms in a virtualized environment.
– Demonstrate real-world attacks against typical business platforms and applications.
– Implement defensive procedures to address potential vulnerabilities and attacks.
– Demonstrate the level of effectiveness of defensive procedures against real-world attacks.

Course Applicability

– IT 467 is an option in the Cyber Security (CYBR) concentration of the Bachelor of Science in Information Technology, and a Technical Focus Course in the Information Technology Minor and the Information Technology Undergraduate Certificate.

Faculty and Staff

Course Coordinator:
Prof. Lyons

Instructors:
See Scheduled Sections above.
See links to faculty home pages for information on office hours, contact preferences, etc.

Teaching Assistants:
To be assigned – see Blackboard

Administrative support:
Department of Information Sciences and Technology
Fairfax campus
5400 Nguyen Engineering Building
Email: bsit@gmu.edu
Phone: 703-993-3565
References

Textbooks

There are no required textbooks for this course.

Grading

Grades will be awarded in accordance with the Mason Grading System for undergraduate students. See AP.3.1 Undergraduate Grading for more information.

The grading scale for this course is:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>97 – 100%</td>
<td>A+</td>
</tr>
<tr>
<td>93 – 96%</td>
<td>A</td>
</tr>
<tr>
<td>90 – 92%</td>
<td>A-</td>
</tr>
<tr>
<td>87 – 89%</td>
<td>B+</td>
</tr>
<tr>
<td>83 – 86%</td>
<td>B</td>
</tr>
<tr>
<td>80 – 82%</td>
<td>B-</td>
</tr>
<tr>
<td>77 – 79%</td>
<td>C+</td>
</tr>
<tr>
<td>73 – 76%</td>
<td>C</td>
</tr>
<tr>
<td>70 – 72%</td>
<td>C-</td>
</tr>
<tr>
<td>60 – 69%</td>
<td>Passing*</td>
</tr>
<tr>
<td>0 – 59%</td>
<td>F</td>
</tr>
</tbody>
</table>

* Grades of "C-" and "D" are considered passing grades for undergraduate courses, but those grades may not be applicable as prerequisite grades or towards graduation, depending on the program and the Catalog Year. See the University Catalog for more information.

Raw scores may be adjusted by the Instructor to calculate final grades.

Final grades will be determined based on the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journals</td>
<td>15%</td>
</tr>
<tr>
<td>Assignments</td>
<td>35%</td>
</tr>
<tr>
<td>Mid-term exam</td>
<td>25%</td>
</tr>
<tr>
<td>Final exam</td>
<td>25%</td>
</tr>
</tbody>
</table>

These components are outlined in the following sections.

Journals

Each student will create an individual journal summarizing activities and learning on a weekly basis, as directed by the Instructor.
Assignments

Individual and group work will be assigned throughout the semester. Each assignment will count towards the final grade - there are no "optional" assignments. Each assignment is to be prepared and submitted as specified by the Instructor.

Mid-term exam

The mid-term exam will be held in the sixth scheduled class session. Students will receive feedback on the grading of their exams.

Final exam

The final exam will be held as scheduled by the Registrar. Students will not receive feedback on the grading of their exams.

Please note that exams may be re-scheduled to compensate for disruptions in the semester schedule and students are required to be available throughout the exam period including the scheduled Make-up Day.

A student with an exam conflict (or other circumstance that would justify rescheduling an exam under Mason policy), must notify the Instructor no later than 2 weeks prior to the scheduled exam. A student in an online section who wishes to take a proctored exam at another location must notify the Instructor no later than 3 weeks prior to the scheduled exam and the student will be responsible for making appropriate arrangements in accordance with Mason Policy 3004.

There are no opportunities for "extra credit" in this course. All students will be given the same opportunities to complete assigned work.

Students are expected to submit work as scheduled by the Instructor. Any assignment submitted after the due date-time but within 24 hours of it will be graded with a penalty of 25% of the available credit. Any assignment submitted more than 24 hours late will not be graded. Exceptions to the submission time requirement may be made at the sole discretion of the Instructor.

Mid-term and final grades will be posted to PatriotWeb, which is the only mechanism for students to obtain those grades. A student with a "hold" on his/her PatriotWeb account will be unable to access grades until the hold has been removed.

Schedule

This schedule is subject to revision before and throughout the course. Registered students should see Blackboard for the latest class schedule.

Important Dates

Please see the Fall 2021 Academic Calendar for important dates, including the last days to add and drop courses.
Religious Holidays

A list of religious holidays is published by University Life. Any student whose religious observance will conflict with a scheduled course activity must notify the Instructor at least 2 weeks in advance in order to make alternative arrangements.
<table>
<thead>
<tr>
<th>Lecture</th>
<th>Content</th>
</tr>
</thead>
</table>
| 1       | Introductions, Logistics, Overview  
          Information system architecture; Network partitioning |
| 2       | Introduction to virtualization |
| 3       | Physical and infrastructure security  
          Reconnaissance, footprinting |
| 4       | Firewalls  
          Access control, user authentication  
          Intrusion detection and prevention, logging and auditing, incident reporting |
| 5       | Platform security  
          Review for mid-term exam |
| 6       | **Mid-term exam**  
          Team work |
| 7       | Malicious software – Trojan horses, viruses, worms, bots |
| 8       | Malicious software – buffer overflows, root kits |
| 9       | Code injection attacks |
| 10      | Denial of service attacks |
| 11      | Protocols and standards  
          IP Security, SSL/TLS, S/MIME |
| 12      | Authentication applications  
          Kerberos, X.509, federated identity management |
| 13      | Guest lecture |
| 14      | Review for final exam |
|         | **Final exam** |

**Attendance Policy**

Students are expected to attend every class, to complete any required preparatory work (including assigned reading – see **Mid-term exam**)
The mid-term exam will be held in the sixth scheduled class session. Students will receive feedback on the grading of their exams.

**Final exam**

The final exam will be held as scheduled by the Registrar. Students will **not** receive feedback on the grading of their exams.

Please note that exams may be re-scheduled to compensate for disruptions in the semester schedule and **students are required to be available throughout the exam period including the scheduled Make-up Day**.

A student with an exam conflict (or other circumstance that would justify rescheduling an exam under Mason policy), must notify the Instructor **no later than 2 weeks prior to the scheduled exam**. A student in an online section who wishes to take a proctored exam at another location must notify the Instructor **no later than 3 weeks prior to the scheduled exam** and the student will be responsible for making appropriate arrangements in accordance with Mason Policy 3004.

There are **no** opportunities for "extra credit" in this course. All students will be given the same opportunities to complete assigned work.

Students are expected to submit work as scheduled by the Instructor. Any assignment submitted after the due date-time but within 24 hours of it will be graded with a penalty of 25% of the available credit. Any assignment submitted more than 24 hours late will not be graded. Exceptions to the submission time requirement may be made at the sole discretion of the Instructor.

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**Schedule** above) and to participate actively in lectures, discussions and exercises. As members of the academic community, all students are expected to contribute regardless of their proficiency with the subject matter.

Students are expected to make prior arrangements with Instructor if they know in advance that they will miss any class and to consult with the Instructor as soon as possible if they miss any class without prior notice. Any student who expects to miss more than one class session is **strongly advised** to drop the course and take it in a later semester when the student can attend every class.

Mason policy AP.3.10 requires students to take exams at the scheduled time and place, unless prior approval is granted by the student's academic dean or director. An **unexcused** absence from an exam will result in a score of zero (0) for that exam. Please note that exams may be re-scheduled by the Registrar to compensate for disruptions in the semester schedule and **students are required to be available throughout the exam period including the scheduled Make-up Day**.
Campus Notifications

Students are encouraged to subscribe to the Mason Alert system to receive notifications of campus emergencies, closings, and other situations that could affect class activities.

Each classroom has a poster explaining actions to be taken in different types of crisis. Further information on emergency procedures is available at the Emergency Management Web site. In the event of a possible emergency, students are encouraged to dial 911.

Classroom conduct

Students are expected to use the online tools provided solely for learning in relation to this course. Misuse of online tools may result in denial of access to those tools or other consequences under Mason policies.

Communications

Registered students will be given access to a Blackboard section for this course. Blackboard will be used as the primary mechanism (outside of lectures) to disseminate course information, including announcements, lecture slides, homework and other assignments, and scores for homework and exams. Some announcements may be sent via Blackboard to students' Mason email accounts.

Communication with the Instructor on issues relating to the individual student only should be conducted using Mason email, via telephone, or in person - not in the public "Discussions" forums on Blackboard. To protect student privacy any communication related in any way to a student's status must be conducted using secure Mason systems – if you use email to communicate with the Instructor you MUST send messages from your Mason email account. Students must activate and monitor their Mason email accounts to receive important information from the University, including messages related to this class. Students are advised to use Blackboard, Tools, Send Email, Select Users to originate email messages to an Instructor.

Lecture slides are complements to the lecture process, not substitutes for it - access to lecture slides will be provided in Blackboard as a courtesy to students provided acceptable attendance is maintained.

All course materials (lecture slides, assignment specifications, etc) are published on Blackboard in Adobe® Portable Document Format (PDF). This allows users of most computing platforms to view and print these files. Microsoft® Word (or a compatible word processing application) is required for preparing assignments – it is available on computers in the Mason open labs.

Online sections will use several tools through Blackboard. Students are responsible for obtaining Internet access and a compatible platform. Appropriate computers are available on campus in open labs.
Privacy

Instructors respect and protect the privacy of information related to individual students. For information on student rights and privacy under the Family Educational Rights and Privacy Act of 1974 (FERPA) please see FERPA at Mason.

As described above, issues relating to an individual student will be discussed via email, telephone or in person. Instructors will not disclose protected information identifiable to an individual student with other students (or anyone without a need to know) without prior permission of the student.

Homework, quizzes, mid-term exams and other assessable work will be returned to each individual student directly by the Instructor (or by a faculty member, staff member, or Teaching Assistant designated by the Instructor, or via another secure method). Under no circumstances will a student's graded work be returned to another student.

Instructors, Teaching Assistants, and staff will take care to protect the privacy of each student's scores and grades.

Academic Integrity

All members of the Mason community are expected to uphold the principles of scholarly ethics.

The IT major has been designed to achieve several specific outcomes. One of those outcomes is: “An understanding of professional, ethical, legal, security, and social issues and responsibilities.”

Graduating students are bound by the ethical requirements of the professional communities they join. The ethics requirements for some of the communities relevant to IT graduates are available via the following links:

- ACM Code of Ethics and Professional Conduct
- IEEE Code of Ethics
- EC-Council Code of Ethics

On admission to Mason, students agree to comply with the requirements of the Mason Honor Code and System. The Honor Code will be strictly enforced in this course. Honor Code cases are heard by a panel of students – students who meet the requirements are encouraged to nominate themselves to serve on the Honor Committee.

Any use of the words or ideas of another person(s), without explicit attribution that clearly identifies the material used and its source in an appropriate manner, is plagiarism and will not be tolerated. The Instructor reserves the right to use manual and/or automated means (including such services as SafeAssign) to detect plagiarism in any work submitted by students for this course, and to direct Teaching Assistants and/or other faculty and/or staff members to do likewise in support of this course.
For this course, the following requirements are specified:

- All assessable work is to be prepared by the individual student, unless the Instructor explicitly directs otherwise.

- All work must be newly created by the individual student for this course for this semester. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the Instructor.

Students may seek assistance with assigned work (and are encouraged to do so if they feel the need), provided:

- The directions for the assigned work do not prohibit such assistance.

- Such assistance is *explicitly acknowledged* in the submitted work, clearly identifying the person(s) giving assistance and the nature of the assistance given.

- Any individual work to be submitted is prepared entirely and exclusively by the student submitting it. Students are expressly prohibited from sharing any individual assessable work for this course in any manner with other students (except students assigned as Teaching Assistants or Undergraduate Peer Mentors to this course and the student's section), unless all students involved have had their work graded and returned by the Instructor, or the Instructor has explicitly approved such sharing.

Another aspect of academic integrity is the free exchange of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When using online tools to communicate, students are expected to follow the conventions of *Netiquette*. Mason values diversity: through the Office of Diversity, Inclusion, and Multicultural Education (ODIME), Mason seeks to create and sustain inclusive learning environments where all are welcomed, valued, and supported.

Students are encouraged to ask for clarification of any issues related to academic integrity and to seek guidance from the Instructor, other faculty members, academic advisors, or the Office for Academic Integrity.

**Disability Accommodations**

*Disability Services* works with disabled students to arrange for appropriate accommodations to ensure equal access to university services. Any student with a disability of any kind is strongly encouraged to register with Disability Services as soon as possible and take advantage of the services offered.

Accommodations for disabled students *must* be made in advance – Disability Services cannot assist students retroactively. Any student who needs accommodation should contact the Instructor no later than the first class.
If a student has an accommodation that allows the student to take an exam in the Disability Services Testing Center, the Instructor will determine the date and time of that exam – the student must not contact Disability Services to schedule the exam until the Instructor has advised the date and time.

**Other Resources**

Mason provides many useful resources for students – see [Students - George Mason University](https://www.gmu.edu/). The following resources may be particularly useful:

- Volgenau School of Engineering - Computing Resources
- The Writing Center
- Academic Advising
- University Libraries
- Counseling and Psychological Services
- University Career Services

Students in online sections may benefit from these resources:

- Online Learning Resources
- [University Libraries - Mason Online](https://www.lib.gmu.edu/)

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