**CS - 390Y - Computer Security Offense and Defense Summer 2020**

**01. UG Omnibus Course (New or Modification)**

# Due Dates

**Deadlines for nonsubstantive curriculum can be found:**

**On the** [**Curriculum Website**](https://msudenver.edu/curriculum/)

**On your Curriculog dashboard under 'My Upcoming Events' In the** [**Procedual Calendar**](https://msudenver.edu/academic-affairs/guidelinesandpolicydocuments/proceduralcalendar/)

**In order to meet the deadline, this proposal must be on the *Associate Dean* step on or before the listed due date.**

**NOTE: Omnibus courses may be offered only three times.**

# Directions for Form

**Please read instructions and information below before you begin your curriculum proposal. You may also consult the following resources which can provide additional assistance in understanding this form and the curriculum process.**

[**Curriculum Website**](https://msudenver.edu/curriculum/)

**This form SHOULD be used for the following:**

**Creating a new undergraduate omnibus course**

**Modifying an existing undergraduate omnibus course**

**This form SHOULD NOT be used for the following:**

**Creation of a new permanent course**

**Modifying an existing permanent course**

**Creation or modification of a graduate omnibus course**

**All fields that are marked with an asterisk (\*) are required. You will be unable to launch the proposal without completing all required fields.**

**You are encouraged to turn on the help text using this icon (****) at the top of the page.**

**Each Section will have additional directions attached. Please follow instructions. Proposals that are incomplete or filled out incorrectly will be returned to the originator.**

**You will need to LAUNCH the proposal using this icon: and then APPROVE the launched proposal using this icon:**

**If you have questions, concerns, or need assistance in filling out this proposal form, you can contact the Associate Director of Curriculum and Catalog.**

# Department and Originator Information

**College/School:\***

**College of Letters, Arts and Sciences**

**Department:\***

## Department of Mathematical and Computer Sciences

**Name of Proposal** Steve Beaty **Originator:\***

**Email of Proposal** beatys@msudenver.edu

**Originator:\***

**Please indicate the semester you wish this change to be effective. You may view curriculum due date information at the top of this page. If you select a semester that the due dates have passed for, it will be implemented the following semester.**

**\*Please make sure you also put the semester and year you want the course to run in the course title field (example: (Fall 2019).**

**Indicate effective semester\*** Spring Summer Fall

# Curriculum Proposal Justification and Resource Implication

**Justification and resource implication for proposed** Computer science students increasingly need to be aware of the effects cybersecurity has on their professional careers and this **omnibus course:\*** class will help address that. This course will be taught in-load and so require no additional resources.

# Course Title Information

**Prefix\***

 **CS Course Number\*** 390Y

**Course Title (include** Computer Security Offense and Defense Summer 2020 **semester and year for course**

**to run)\***

**Transcript/Banner Course** Comp Sec Offense & Defense **Title:\***

**Course Type**

**CIP codes, or the Classification of Instructional Program codes, are used for purposes such as reporting to identify different subjects. You may see a full list of CIP codes** [**here.**](https://nces.ed.gov/ipeds/cipcode/browse.aspx?y=55) **If you are unsure what CIP best suits your program, you may contact the Associate Director of Curriculum and Catalog for assistance.**

**CIP Code:**

**Status\*** Active-Hidden

# Course Hours, Restrictions, and Repeat Information

**To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.**

**Federal Credit Hour Definition: *A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:***

***(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of- class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward to the award of credit hours. 34CFR 600.2 (11/1/2010)***

**Credits:\*** 4

**Distribution of Credits:\*** 4+0

**Schedule Type(s):\***

 **Lecture Grade Mode(s):\***

## Letter

**Face-to-Face or Equivalent Hours per course**

**Consult Appendix B and C of the** [**Curriculum Manual**](https://msudenver.edu/media/content/curriculum/documents/UndergraduateCurriculumManualFinal8-2018.pdf) **to detemine the hours for the course**

**Lecture:** 60

**Lab:**

**Internship:**

**Practicum:**

**Other Hours:**

**Additional Student Work** 120 **Hours:**

**Please answer yes or no to the below questions. If you answer yes to any of the questions, please fill out the related field on the right.**

**Is this course a specified** No

**repeatable course?\*If yes, indicate specified**

Yes

**repeatable number of credits and/or repeats allowed:**

**A specified repeatable course is a course that allows a student to repeat the course either in its entirety or for a certain identified total number of credit hours. If you decide to make your course repeatable, please specify either how many times a student can repeat the course for credit, or for the total number of credits they can receive.**

**Are there course** No

**equivalencies?\*If yes, list all equivalent**

Yes **courses:**

**Will this course be requesting** No

**a crosslisting with any otherIf yes, list all new prefix(es)?\*** Yes **crosslistings:**

**If you are planning for this new course to have crosslisting(s), please use form Form #4 to request new crosslisting(s).**

**If you wish to add Registration Restriction(s), you may do so below.**

**Level will restrict courses based on graduate or undergraduate standing.**

**Class will restrict courses based on what class a student is in (eg. freshman).**

**Program or Major can both be used to restrict courses to only allow specific declared programs to take the course.**

**Student Attribute can be used to restrict courses based on other attributes, eg. DIME students.**

**Program:**

**Major:**

**Level:**

**Class:**

**Student Attribute:**

# Catalog Course Information

**The following fields will allow you to attach prerequisites, corequisites, or prerequisites or corequisites to your course. Please specify if you want and of these prerequisites, corequisites, or prerequisites or corequisites Banner enforced. Banner enforcement**

**means that the requirement will be enforced when the student attempts to register for a course. If you do not Banner enforce the requirement, the system will not check the student's record for the requirement to be met.**

**Please also indicate the minimum passing grade. If you do not indicate a minimum passing grade, it will default to a "D-" and you will be required to complete another curriculum proposal to modify this minimum passing grade, even if your program has a different minimum passing grade.**

**Prerequisite(s):** CS3250 and CS2400 with C- or better

**Banner Enforced** CS3250 and CS2400 **Prerequisite(s):**

**Minimum Passing Grade for** C-

**Banner Enforced Prerequisite(s):**

**Corequisite(s):**

**Banner Enforced Corequisite(s):**

**Prerequisite(s) or Corequisite(s):**

**Banner Enforced**

**Prerequisite(s) or Corequisite(s):**

**Minimum Passing Grade for**

**Banner Enforced**

**Prerequisite(s) or Corequisite(s):**

**Course Description:\*** This course introduces the basics of performing vulnerability assessments for networks, computers, and programs. Included is coverage of reconnaissance and exploitation tools, SQL injections, weak password detection, and memory corruption techniques. The course covers defense techniques including firewalls, intrusion detection/prevention systems, log analysis, event correlation, and security information and event management. The course also covers how programs are compromised via buffer overflows and heap corruption, along with techniques to counter those attacks.

# Course Content

**The following section is the course content. Please adhere to the following format for each section:**

**Required reading: Smith, J.R. (2014). Book of Examples. New York, NY: McGraw-Hill**

**List each material in this format. If there are mutiple matierlas please format them in a bullet or list style**

**Specific Measurable Student Behavioral Learning Objectives: 1, a, i, ii, etc.**

**Detailed Outline of Course Content or Outline of Field Experience/Internship: I, A, 1, a, etc.**

**Evaluation of Student Performance: 1, a, i, ii, etc.**

**You can use the numbering list feature with this icon () in the toolbar above each field. Right click on a number in the list and select "Numbered List Properties" to change the numbering style to adhere to the above formatting requirements.**

**Required reading and other materials will be equivalent**

**to:\***Peter Kim (2018). The Hacker Playbook 3: Practical Guide To Penetration Testing Jon Erickson (2008). Hacking: The Art of Exploitation, 2nd Edition

|  |  |
| --- | --- |
| **Specific, Measurable Student****Behavioral Learning** |   |
| **Objectives:\*** | 1. Formulate approaches to performing reconnaissance. |

1. Analyze the results from network scans.
2. Appraise the results of audits from servers and services.
3. Compose a toolkit for penetration testing.
4. Given a particular platform and network architecture, create a plan for testing its weaknesses.
5. Evaluate several approaches to intrusion detection and prevention.
6. Design a stateful packet filtering firewall.
7. Analyze log files using appropriate tools.
8. Assess the various techniques for creating and deploying malware.
9. Construct effective programming defenses against typical attacks.

**Detailed Outline of Course**

**Content (Major Topics and**

**Subtopics) or Outline of Field**

**Experience/Internship:\***

1. Introduction to computer security
	1. Confidentiality, Integrity, Availability
2. Introduction to TCP/IP networking
	1. IPv4 and IPv6
	2. TCP versus UDP
	3. Addressing
		1. Classes
		2. Netmasks
		3. Private IP addresses
		4. Routing
		5. Security
			1. Transport Layer Security
			2. IP Security
3. Introduction to cryptography
	1. Symmetric
	2. Asymmetric
	3. Public and private keys
4. Authentication and authorization
	1. Factors and multi-factor authentication
	2. Role-based authorization
5. Web application vulnerabilities
	1. SQL injections
	2. Cross-site scripting
6. Operating System and application exploitation
	1. Buffer and stack overflows
	2. Heap corruption
	3. Countermeasures
		* 1. Address Space Layout Randomization
			2. Canaries
			3. Hardened operating systems
7. Tools for vulnerability assessment
	1. Network scanners
	2. Host auditing
8. Passwording
	1. Cracking and countermeasures
9. Defending networks
	1. Network intrusion detection systems
	2. Firewalls
	3. Virtual Local Area Networks
	4. Virtual Private Networks
10. Defending Hosts
	1. Host intrusion detection systems
	2. Anti-virus and -malware
11. Introduction to malware analysis
	1. Types of malware and infection vectors
	2. Exploiting kernel calls
12. Protecting users
	1. Anti-phishing
13. Ethics
14. Regulations

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1. NIST 800 series

**Evaluation of Student**

**Performance:\*** Approximately six twelve-page research papers and two tests. Each paper counts equally and each test counts for 10% of the final score. The each paper's form is the following.

 Abstract

 What the paper is about in a few sentences.

 Motivation

 Why should someone read your paper? What will they learn?

 Introduction

 Problem statement and your approach to the problem.

 Method/measurement

What did you do to find the answer?

Include screenshots, logs, git diffs, etc. here.

 Results

 What is the answer?

 Conclusion

What are the major points from the paper?

GitHub repository link - required if you wrote any code.

 Bibliography

Formal (peer-reviewed: books, journals, etc.)

Informal (non-peer-reviewed: Wikipedia, blogs, etc.)

Use ACM citation style https://www.acm.org/publications/authors/reference-formatting

 Reflection

What did I learn?

What was easy and difficult?

 What would have made it better?

# Review for Conflict and Overlap

**According to the Undergraduate Curriculum Manual, it is the responsibility of both the originator as well as each level of review to consider potential overlap and curriculum conflict. Any potential overlap or conflict with existing curriculum should be reviewed, and the impacted department(s) should be requested to provide a letter of notification or support, depending on the circumstances. Full information on overlap/conflict can be found** [**here**](https://msudenver.edu/media/content/curriculum/documents/UndergraduateCurriculumManualFinal8-2018.pdf) **and** [**here**](https://msudenver.edu/curriculum/)**.**

**Please Confirm That:\*** I, the originator of this proposal, have completed the necessary due diligence to review this proposal for any potential overlap and/or conflict with existing curriculum.

**Please Confirm That:\*** Any departments identified as having potential overlap and/or conflicts have been contacted and a letter of notification and/or a letter of support has been obtained.

**Attach documentation that supports affected Departments were notified and/or provided support of the proposed changes in the Proposal Toolbox by**

**clicking on** **.**