George Mason University

Cyber Security Engineering (CYSE) 492/493 Two-Semester Senior Design Capstone

SPONSOR HANDBOOK

Rev 1

March 2021

This document is to be used as a guide for both Prospective and Returning Senior Design Sponsors whether they are companies external to George Mason University (GMU) or CYSE Faculty members.

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1 Introduction to CYSE 492/493

The George Mason University (GMU) Cyber Security Engineering (CYSE) course, CYSE 492/493 Senior Advanced Design Project, is a two semester senior design capstone that is intended to provide students with an "industry–like" experience emphasizing technical, management and professional development skills. Students working in teams will complete a cyber security engineering project sponsored by industry or a faculty member. In addition to the technical skills needed to be a cyber security engineer, important "real life" skills such as teamwork, project management, communications, ethics and engineering professionalism will be developed. This course consists of two semesters of lectures and project time, and will culminate with an engineering conference formatted paper and poster session.

Customer-sponsored projects are critical to the success of the program. The work scope of each client-sponsored project will be carefully formulated to satisfy the learning objectives. Students successfully completing this course will be able to:

- Identify and explain the business contract process for engineering project acquisition
- Design a solution to a cyber security engineering problem
- Implement the design solution and verify the performance against the design constraints
- Develop schedules, budgets, project control methods and documents
- Organize and write design documents and project reports
- Organize and make technical presentations that describe a design
- Create engineering solutions to given problems (dependent upon the cyber domain)
- Develop professional skills

2 Sponsor Eligibility

The following are eligible to sponsor a CYSE Senior Design project:

- Full-time, direct employees of organizations or companies external to GMU
- GMU CYSE Faculty
- GMU Professors with courtesy appointments to CYSE
- GMU Professors outside CYSE, with approval from the CYSE Department Head

The following are not eligible to sponsor a CYSE Senior Design project:

- Parents or relatives of students
- Retired, part-time, student, intern, or GMU-paid consulting staff

3 About the Students

GMU's cyber security engineering program strives to prepare graduates using best-in-class practices and curricula. Team sizes are set at 4-6 students with a balanced skill mix to ensure sufficient resources to complete the Sponsor's project. Team sizes other than 4-6 are not permitted, unless there are special requirements that are approved in advance. Sponsors may not sub-divide a design team once formed.

Students have access to computers and computer labs provided by the university. These resources do not include advanced cyber security software products or test data repositories. Students do have the ability to install open source or free cyber security tools, and may also be able to obtain 'student licenses' for certain products at free or reduced prices. These products can be used to work on the Capstone Project with the approval of the sponsoring organization. Sponsoring organizations should consider these software and test limitations and how they may impact the sponsor project description and scope.

4   Roles and Responsibilities

Each capstone project team will consist of a student design team, customer representative, subject matter expert, and program manager/instructor. These roles and responsibilities will be formally documented and reviewed at the project initiation.

4.1   Student Team

There will be 4-6 student members per team that are responsible for the design and completion of a project. Team leadership responsibilities will be rotated. The role of the leader is to interface with the customer, subject matter expert and program manager/instructor. All team members must display professionalism, personal commitment, responsibility for decisions, and regularly communicate to peers and support staff. Periodic self-evaluations will be conducted.

4.2   Customer

The customer will be a formally identified company or faculty member that sponsors the project. The customer will provide the design problem and support throughout the two semesters, and project sponsorship.

The customer will provide any unique and necessary hardware/software/test data needed for the project, including any advanced cyber security software products or test data repositories. Specifically, if test data will be required, the customer must provide the data (obfuscated as necessary) to the student team at the start of the project. Please see Section 3 "About the Students" for more information on the computing capabilities available to the students.

Ideally, the customer will provide a minimum of eight hours per month to perform such tasks as project design reviews, RFQ generation, and monthly status reporting. In addition, the customer should attend the culminating industry day poster paper sessions. Customer satisfaction will be a factor in the design team's final grade.

4.3   Subject Matter Expert (SME)

The SME is a discipline expert that will provide technical information to the student team. The SME has a defined role to consult, advise, and monitor. The SME most likely will be a faculty member, although industry could also provide SMEs. The responsibilities of the SMEs are to provide ongoing technical input and periodic evaluations of design team performance and deliverables. The SMEs are required to display a strong commitment to their program. The SME cannot be retired, part-time, a student, an intern, or consulting member of a company external to GMU. The SME may be a PhD Candidate graduate student if the Sponsor is a GMU CYSE Faculty member.

4.4   CYSE 492/493 Instructor Team

This team is responsible for overall program success. The team is composed of faculty and includes a a Lead Instructor and a Mentor Professors assigned to mentor each student team. Specific duties are outlined below:

- Secure project sponsorship
- Communicate course objectives
- Working with SMEs, matching students to projects based upon student preference and required skill mix
- Conduct classroom lectures
- Monitor student team progress and customer relations, foster open communication
- Act as a student mentor and coach
- Evaluate student performance and assign grades
- Ensure equity among student projects and customer interfaces

5   Defining a Senior Design Project

Prospective Sponsors are requested to complete the nomination form in Appendix A. Guidelines for defining a project are as follows:

- Project has a cyber security engineering focus
- Project is of interest to the Sponsor, but is not on the Sponsors critical path

- Sponsor may not have sufficient time or resources to develop a solution
- Lends itself to a team of 4-6 CYSE students working for two semesters

Appendix A should be submitted electronically to the Instructor for the Fall/Spring academic year. Requested submission dates will be provided to Sponsors separately.

6 Matching Students to Projects

The Instructor will review the sponsorship nomination form to ensure the course learning objectives will be met. A consolidated list of projects will be available to students at the beginning of Fall semester classes. Students will indicate a project preference. The Instructor and appropriate Faculty members will assign project teams.. The Instructor reserves the right for the final determination of team membership and size.

7 Nominal Milestone Schedule

7.1 Pre-Semester

- April – Students sign up for class
- June – Customer provides sponsorship nomination (Appendix A)
- June – SME, Customer, and Instructor refine project/accept project
- July – Customer provides RFP (see RFP template)
- August – Instructor creates draft student teams and assigns Mentor Professors

7.2 Fall/Spring Semester (30 weeks total)

- Week 1 – Students submit Project preferences
- Week 2 – Instructor finalizes teams; Students receive Customer RFP
- Week 5/6 – Project scope, budget, schedule finalized
- Week 5/6 – Technical Approach
- Week TBD – Student teams submit Proposal [middle of first semester]
- Week TBD – Design Review (DR) [end of first semester]
- Week TBD – Prototype complete [early second semester]
- Week TBD – Final deliverable [end of second semester]
- Week 30 – Industry Paper, Poster Session, Andrew Sage Competition [end of second semester]

8 Sponsor Expectations of Students

Most students are taking a full senior-level engineering course load with homework sets, projects, and exams. Applying standard guidelines, students are expected to contribute approximately 9 hours/week for a 3-credit class each semester. Sponsors should expect a "best-effort" on behalf of the students. The Sponsor acting as the Customer will regularly receive status updates and participate in all critical design reviews.

9 Project Outcomes

It is not possible for GMU CYSE to guarantee the results of a particular team or project. As with all teams, there may be factors beyond the control of the University, or the Sponsor, leading to unanticipated project outcomes. Projects that are well defined from the beginning have a higher chance of succeeding.

10 Suggested Funding Levels

An amount of $5,000 is requested per project team. This amount is to help defray the costs associated with Senior Design. Payments are due 60 Days after a project team has been finalized.

11 Projects at a Student's Place of Employment

Projects at a student's place of employment are typically not permitted. However, such projects may be considered if the Sponsor (not the student) originates and defines the project, and agrees in writing to:

- Define a project sufficient in scope for 4-6 students by the prescribed deadline
- Sponsor and technically guide a team of 4-6 via an appointed Subject Matter Expert
- Meet the suggested funding level

Such consideration does not guarantee the approval of such a project nor does it guarantee the forming of a project team.

12 Intellectual Property

Students are prohibited from signing Intellectual Property agreements and Non-Disclosure agreements.

Project posters will be publicly displayed and project notebooks will be publicly available. Projects should not include sensitive content marked as For Official Use Only, Proprietary, Sensitive, or Classified.

If a company requires approval of the poster or other materials to be publicly displayed, it is the responsibility of the Sponsor to obtain company approval in a timely fashion and in accordance with the requirements of the Sponsor's company. In any event, GMU shall be held harmless for the public display of project materials.

The Sponsor has the right to specify that their project team be comprised of US citizens.

13 Grading

Sponsors and SMEs will be asked to assess student performance and the results will be taken into account when determining grades. The Instructor is overall responsible for determining grades.

14 Notifications

GMU CYSE and the Sponsor shall notify each other in writing (email is acceptable) within 10 days of any of the following occurrences:

- Change of Subject Matter Expert
- Change of student team (e.g., drop or prolonged illness)
- Change in availability of facilities
- Redefinition or re-scope of the project

Appendix A (CYSE 492 / 493): Sponsor Project Nomination Form

Sponsor Organization Name: CEC Computing Resources

Sponsor POC:

Name & Title	Yushawn Tang, Linux Admin
Location	GMU Fairfax
Phone	703-993-3180
Email	ytang25@gmu.edu

Sponsor Technical SME:

Name & Title	Elliot Alderson, Penetration Testing Lead
Location	Fairfax, VA
Phone	571-555-1212
Email	Elliot@securityx.com

I. **Project Name** [Choose a name that describes the project's focus]

OpenStack Cloud Penetration testing

II. **Project Objectives** [Describe what you want the student team to accomplish in 2 semesters]

Design a penetration testing program for supporting our evolving cloud infrastructure. The project team will get familiarized with OpenStack architecture and its security guide, and draft a pentration testing plan tailored to the OpenStack platform. The plan will include all essential technical information and processes for CEC staff to safely implement the penetration test against the OpenStack cloud.

III. **Project Overview** [Describe project scope, envisioned execution process, and major requirements]

Example: This is a challenging project that will require students to apply a combination of security knowledge and basic systems engineering principles. First, students will analyze Security Company X's Cloud Security Plan. This plan will be redacted for operational security purposes. Students must conduct a detailed review of the Cloud Security Alliance (CSA) Cloud Penetration Testing Playbook. Based upon these reviews, the student team will create a draft of the Penetration Testing Appendix (to the Security Company X Cloud Security Plan). The appendix must cover all relevant aspects of the penetration testing program, including testing scope, attack vectors, testing tools, testing techniques, and the end-to-end process of testing. Upon Security Company X approval of the appendix, the student team will leverage student accounts to instantiate an IaaS testing environment. Security Company X will provide virtual images and obfuscated data which the student team will deploy into the IaaS testing environment. The student team will conduct penetration testing according to the Penetration Testing Appendix and produce a final report containing findings and recommendations.

IV. **Major Deliverables**

[List 2-4 work products that you want students to develop over the 2 semesters (may include software, research and analysis reports, technical documentation, etc.). Do not list Technical Approach, Proposal, Schedule, or Design – all teams will be required to complete these items via Instructor assignments.]

a. **Required Deliverables (must haves)**

Deliverable	Due Date
Draft Penetration Testing Appendix	Mid Fall
Final Penetration Testing Appendix	Late-Fall
Draft Report	Early Spring
Final Report	Late Spring

b. **Desired Deliverables (nice to haves)**

Deliverable	Due Date
Penetration Testing Tool User Guide	Late Spring
Deep Dive Report	Late Spring

V. **Hours / Week** [How much time can your organization dedicate to managing your student team?]

Example: 4 hours/week. Note: we will make the Sponsor available for review and approval of project deliverables, we will have the SME available for weekly student meetings and reviews.

VI. **Project Resources**

[Define the unique hardware, software, and computing resources (cloud) / data required for this project. Will these be provided by your company? If these items are not furnished, can this project be accomplished in 2 semesters within $5000 for cost of materials, licenses, etc.?]

Example: Yes, Security Company X will furnish a redacted version of our Cloud Security Plan, basic IaaS configuration settings, one or more VM images, and obfuscated test data. Penetration testing tool licenses will be provided (if necessary).

Resource Type	Description	Provided By (GMU or Sponsor)
Compute	IaaS environment configured IAW IaaS high-level design. Use student free-tier accounts.	GMU
Software	Penetration Testing Tool Licenses	Security Company X
Data / Information	IaaS high-level design Cloud Security Plan	
Other	N/A	N/A

VII. **Student Team: Skills and Size**

[Does this project require specific technical skills, technical tools, or data? How many students do you envision working on the project? Please describe these items in order to enable us to ensure student teams are able to perform the work.]

a. **Required Skills**

    b. Desired Skills

    c. Team Size

VIII. Citizenship [Does this Project require US Citizenship (Yes or No)?]