![Valparaiso University]

CYB-672 Spring 18
Secure Software Development

Dates: 01/10-05/15/2018	Time: Online	Location: online
Instructor: Sonja Streuber	Office Hours:	Contact: sonja.streuber@valpo.edu

Introduction
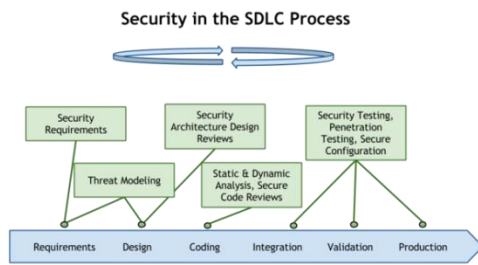
Welcome to CYB-672, Secure Software Development! This 3-credit course introduces a process for designing secure applications that can withstand attacks. The course also discusses security testing and auditing. It focuses on the security issues a developer faces and common security vulnerabilities and flaws. The course explains security principles, strategies, coding techniques, and tools that can help make code more resistant to attacks. Students will write and analyze code that demonstrates specific secure development techniques.

Learning Objectives

At the end of the course, students will be able to:

1. Describe and manage the process for designing and developing secure applications.
2. Identify common security issues and coding flaws.
3. Apply secure coding best practices and evaluate existing code for compliance with these.
4. Implement measures to safeguard data.
5. Confirm whether an organization's security policies and procedures ensure the confidentiality, integrity and availability of the software development process.

Course Format and Attendance Requirement

This is an online course, which means that you will be participating remotely. It does, however, NOT mean that you can log on only once a week. The goal in an online environment is to learn through constant engagement with the material and by communicating with the instructor and your peers.

The class rhythm is as follows:
- Tuesday by 11:59 pm CST: Answer a discussion question
- Thursday by 11:59 pm CST: Respond to TWO of your peers' posts
- Saturday evening by 11:59 pm CST (or before!): Upload the weekly lab assignment

Textbooks & Materials

- Richardson, Theodore, and Charles Thies (2013). *Secure Software Design.* Jones & Bartlett Learning. ISBN 978-1449626327. A copy is on 2-hour reserve at the Christopher Center Library Circulation Desk.
- RECOMMENDED: Kochan, Stephen (2015). *Programming in C*. 4th edition. Pearson Learning.

- A laptop computer with administrative rights.
- Eclipse C/ C++ Developer IDE at https://www.eclipse.org/downloads/packages/eclipse-ide-cc-developers/keplersr2
- OracleVirtualBox, available at https://www.virtualbox.org/

Workload and Grading

This 3-credit course requires significant research and teamwork. You will be completing the following:

- **Attendance & Preparation (10 points per week = 150 total)**: Each Tuesday, answer a question in the weekly discussion forum (5 pts). Each Thursday, respond to TWO of your peers' responses (5 pts). **This activity cannot be made up.**
- **Labs (10 points each = 150 total)**:   Each week contains one lab assignment about a theoretical, practical, or programming problem based on an assigned case study. Solutions must be posted on Blackboard by 11:59 pm CST on Saturday evening of the week in which they are due.
- **Final Exam (100 points)**: The final exam will be a randomized 50-question multiple-choice and multiple-answer exam covering the material throughout the course. It is scheduled by the university registrar and is shown in the Important Semester Dates section on Blackboard and at the end of the course schedule. You have 60 minutes to complete the exam.

You can earn up to 400 points in this course. No extra credit assignments will be given.

Letter Grade Conversion:

>93%: A	90-93%: A-	87-90%: B+	83-87%: B	80-83%: B-	77-80%: C+
73-77%: C	70-73%: C-	<70%: F			

Assignment Submission, Late Work, and Academic Honesty

- **Assignment Submission:** All Assignments must be submitted on Blackboard. **No emailed Assignments will be accepted.**
- **Late Work:** Work is considered late if not posted to Blackboard by 11:59 pm CST of the day on which it is due. **Late work will lose 50% of the grade.**
- **Academic Honesty:** All work you submit for this course must be your own. You may NOT use anyone else's words (from blogs, webpages, purchased solutions, etc.) without giving a clear source citation. If you are unsure, consult http://www.plagiarism.org/ or the Writing Center. In addition, you must write and sign with your name the following statement on all course work:

     I have neither given nor received, nor have I tolerated others' use of unauthorized aid.

For more information about Valparaiso University's Academic Honor Code, case review cycles, and potential penalties, please refer to http://www.valpo.edu/student/honorcouncil/index.php

Any work found in noncompliance with the Valparaiso University Honor Code will receive 0 points and be referred to the Graduate School.

Diversity and Inclusion

Valparaiso University aspires to create and maintain a welcoming environment built on participation, mutual respect, freedom, faith, competency, positive regard, and inclusion. This course will not tolerate language or behavior that demeans members of our learning community based on age, ethnicity, race, color, religion, sexual orientation, gender identity, biological sex, disabilities (visible and invisible), socio-economic status, or national origin. The success of this class relies on all students' contribution to an anti-discriminatory environment where everyone feels safe, welcome, and encouraged to engage, to explore, and ultimately, "to embark on a rewarding personal and professional journey" (Pres. Heckler).

Title IX

Valparaiso University strives to provide an environment free of discrimination, harassment, and sexual misconduct (sexual harassment, sexual violence, dating violence, domestic violence, and stalking). If you have been the victim of sexual misconduct, we encourage you to report the incident. If you report the incident to a University faculty member or instructor, she or he must notify the University's Title IX Coordinator about the basic facts of the incident. Disclosures to University faculty or instructors of sexual misconduct incidents are not confidential under Title IX. Confidential support services available on campus include: Sexual Assault Awareness & Facilitative Education Office "SAAFE" (219-464-6789), Counseling Center (219-464-5002), University Pastors (219-464-5093), and Student Health Center (219-464-5060). For more information, visit http://www.valpo.edu/titleix/ .

Access and Accommodation Services

The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.

Academic Support

To get help, use the Academic Success Center (ASC) online directory (valpo.edu/academicsuccess) or contact the ASC (academic.success@valpo.edu) to help point you in the right direction for academic support resources for this course. Valpo's learning centers offer a variety of programs and services that provide group and individual learning assistance for many subject areas. These learning centers include:

- Graduate Tutoring Lab: Serves the academic needs of Graduate students – tutors offer suggestions on organization of papers, assist in research and citations, and help in understanding difficult assignments. Additional one on one tutoring is also available.
- Writing Center: Primarily serves the needs of undergraduate students, but is also available for Graduate students. Writing Consultants provide proofreading and editing assistance for papers and assignments.

Library Services

The librarian best able to help you navigate information resources for independent research or additional reading is listed on the library research guide for our department. Click the link to Library Guides within the Blackboard table of contents for this course.

Class Cancellations

Notifications of class cancellations will be made through Blackboard with as much advance notice as possible. It will be both posted on Blackboard and sent to your Valpo e-mail address. If you don't check your Valpo e-mail account regularly or have it set-up to be forwarded to your preferred e-mail account, you may not get the message. Please check Blackboard and your Valpo e-mail (or the e-mail address it forwards to) before coming to class.

Schedule

Week	Start Date (all 2018)	Weekly Topic	Readings and Videos (read and watch before Monday)	Due by 11:59 pm CST
1	01/10	Introduction and Current and Emerging Threats	Richardson 1, 2 Other materials as posted on Blackboard	R: Post S: Response S: LAB_1
2	01/15	SYSTEMIC THREATS--The Network Environment Basics of the C Programming Language	Richardson 3 Lynda.com Course on C Essential Training: 1-2 Other materials as posted on Blackboard	T: Post R: Response S: LAB_2
3	01/22	SYSTEMIC THREATS--The Operating System Environment Data Types, Strings, and Variables in C	Richardson 4 Lynda.com Course on C Essential Training: 3-5 Other materials as posted on Blackboard	T: Post R: Response S: LAB_3
4	01/29	SYSTEMIC THREATS--The Database Environment Basics of SQL and Database Design Functions in C	Richardson 5 Lynda.com Course on C Essential Training: 6-7 Other materials as posted on Blackboard	T: Post R: Response S: LAB_4
5	02/05	SYSTEMIC THREATS--Programming Languages Loops and Arrays in C Low-Level Security in C (and most prominent attack models)	Richardson 6 Lynda.com Course on C Essential Training: 8-10 Other materials as posted on Blackboard	T: Post R: Response S: LAB_5
6	02/12	ADVANCED THREATS—Zero Day Exploits Low-Level Memory-Based Attacks in C	Richardson 16 Lynda.com Course on C Essential Training: 11-12 Other materials as posted on Blackboard	T: Post R: Response S: LAB_6
7	02/19	ADVANCED THREATS--Secure Data Management Defenses Against Memory-Based Attacks in C	Richardson 14 Lynda.com Course on C Essential Training: 13-14 Other materials as posted on Blackboard	T: Post R: Response S: LAB_7
8	02/26	ADVANCED THREATS--Web Application Threats SQL injection, Cross-site scripting (XSS), input validation	Richardson 15	T: Post R: Response S: LAB_8
SPRING RECESS 03/02 8 pm CST to 03/18 8 am CST				
9	3/19	SECURE DESIGN--Security Requirements Planning Threat Modeling and Architectural Risk Analysis, Good Programming Practices	Richardson 7 Lynda.com Course on C Essential Training: 15-16 Other materials as posted	T: Post R: Response S: LAB_9

			on Blackboard	
10	03/26	SECURE DESIGN-- Vulnerability Mapping The Basics of UML Secure Design Principles, Top Design Flaws	Richardson 8 Lynda.com Course on C Essential Training: 17 Other materials as posted on Blackboard	T: Post R: Response S: LAB_10
11	04/02	SECURE DESIGN-- Development and Implementation Static Analysis, Flow Analysis, and Context-Sensitive Analysis	Richardson 9 Other materials as posted on Blackboard	T: Post R: Response S: LAB_11
12	04/09	SECURE DESIGN-- Application Review and Testing Symbolic Execution	Richardson 10 Other materials as posted on Blackboard	T: Post R: Response S: LAB_12
13	04/16	SECURE DESIGN-- Incorporating SSD with the SDLC Practical Penetration Testing	Richardson 11 Other materials as posted on Blackboard	T: Post R: Response S: LAB_13
14	04/23	REDEFINING SECURITY--Personnel Training, A Culture of Security Fuzzing	Richardson 12 Other materials as posted on Blackboard	T: Post R: Response S: LAB_14
15	04/30	REDEFINING SECURITY--A Culture of Security Course Summary	Richardson 13 Other materials as posted on Blackboard	T: Post R: Response S: LAB_15
FINAL	05/12 10:00 am -10:00 pm CST	COURSE FINAL as posted by Office of the Registrar		FINAL

APPENDIX

Student Learning Objectives—Graduate School
1. Students will understand and practice methods of inquiry and strategies of interpretation within the student's field of study.
2. Students will master the knowledge and skills pertinent to the student's field of study.
3. Students will effectively articulate the ideas, concepts, and methods through written and oral presentation.
4. Students will understand the connection between their knowledge and skills on the one hand and their professional identity, responsibilities, and demands on the other.
5. Students will integrate knowledge and methods of their study with cognates and other disciplines.
6. Students will study, reflect upon, and practice ethical behavior and cultural sensitivity as they relate to professional and personal responsibility.

Student Learning Objectives—Information Technology Program
1. To understand and practice methods of inquiry and strategies of interpretation within the student's field of study.
   1A. Students will master several programming environments.
   1B. Students will learn to identify and isolate problems.
2. To master the knowledge and skills pertinent to the student's field of study.
   2A. Students will acquire an extensive technology related vocabulary.
   2B. Students will become comfortable using a wide range of technology environments.
3. To effectively articulate the ideas, concepts, and methods through written and oral presentation.
   3A. Students will be taught how to make formal, oral presentations and be required to give 6 such presentations during their program.
   3B. Students will write numerous, thorough papers requiring extensive research. They will be required to use the   services on the writing center.
4. To understand the connection between their knowledge and skills on one hand and their professional identity, responsibilities, and demands on the other.
   4A. Students will understand the implications of legal and professional regulations as they relate to information technology.
   4B. Students will study how technology can be made available to people that are traditionally less advantaged.
5. To integrate knowledge and methods of their study with cognates and other disciplines.
   5A. Students will learn techniques of modeling data from other disciplines.
   5B. Students will study human factors in IT.
6. To practice ethical and cultural sensitivity as it relates to professional and personal responsibility.
   6A. Students will examine a wide range of ethical issues related to technology and the potential effects on people and the environment.
   6B. Students will explore the relationship between IT and ethnic and cultural diversity.