Dr. Kenneth E. Nidiffer

Managing and Leading Software Projects
Software Engineering 625
Volgenau School of Information Technology and Engineering
George Mason University

Class Syllabus for SWE 625

Spring 2021

Overview of the Class Syllabus for SWE 625

- Why Take SWE 625?
- Scope
- Motivation
- Biography
- Administration
- Course Text
- Major Topics
- Course Background Requirements
- Course Evaluation Procedure
- Lecture Topics
- Blackboard Learn – course materials and online presentations

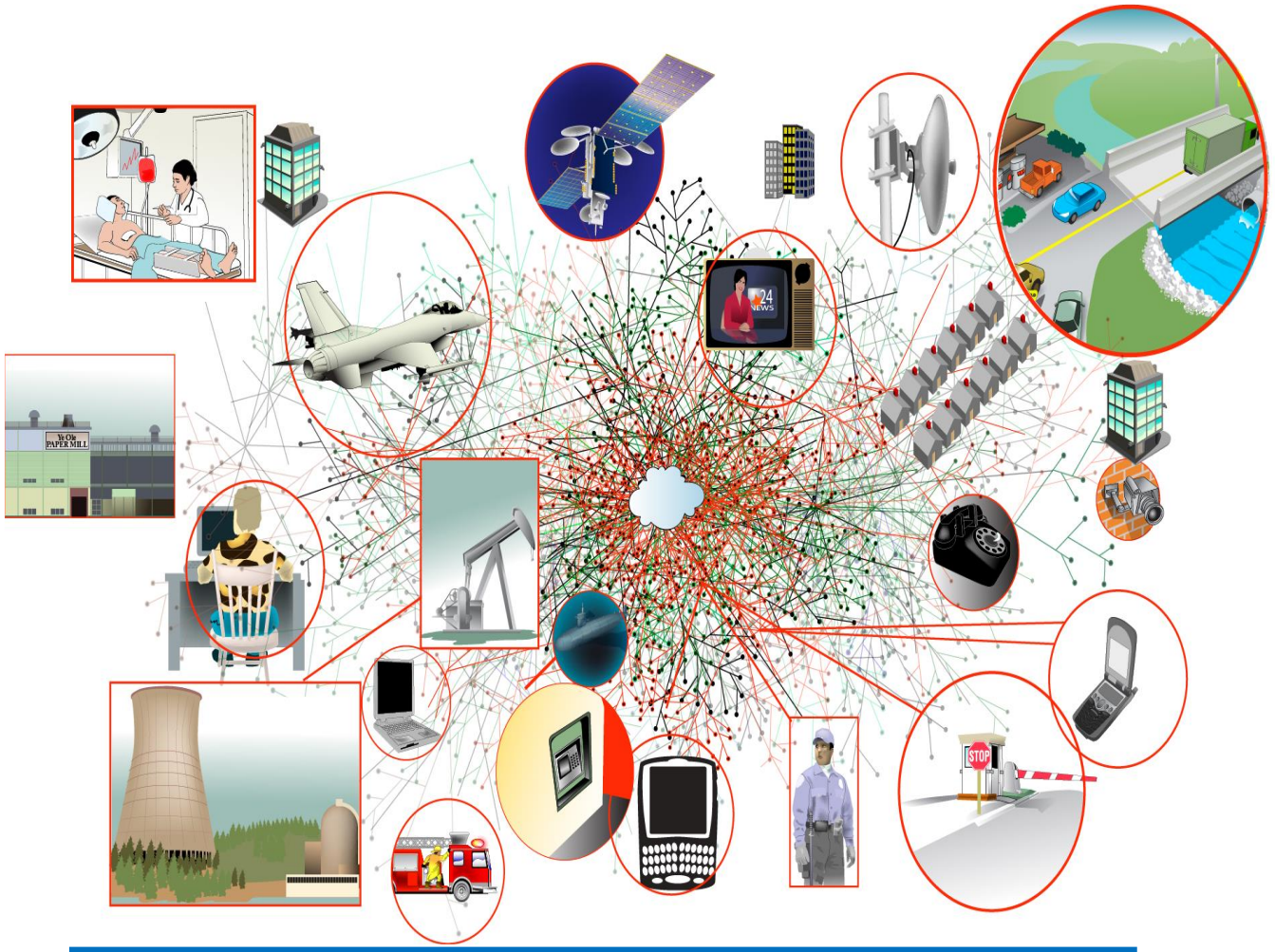
Why Take SWE 625?

- Successfully managing software intensive projects is a **priority** for the industrial, government and academic organizations
- The ubiquity of software and its critical role require fundamental shifts in software engineering management and engineering to maintain competitive advantage
- The course helps participants to **rapidly deploy innovation with confidence** within this shifting landscape by:
  - Applying new principles in software **engineering management for software intensive systems**
  - Developing new practices for **enabling business/mission capability with software innovation**
- **Equips students** in applying new management techniques in today's competitive job market

Scope of Software Engineering Management

Mission Focused

- System of Systems – all types
- Networked Hardware/ Platforms
- Infrastructure
- Applications
- Workforce: People who digitally connect to cyberspace



"Software is the building material for modern society"

Source: SEI

Fundamental Shifts in Software Management & Engineering

As software and systems are increasingly becoming **bigger**, **more complex**, and **intertwined**, software management and engineering and the roles people play are evolving in response.

Time

Developers write code	Models generate code	AI/ML assists in generating models/code
Software release based on milestones (typically 12 – 24 months)	Continuous integration and continuous deployment (CI/CD)	Automated release-observe-refine
Collect data and evidence from past projects to make predictions	Moving beyond prediction to determining causality	Feedback of data and results to re-train models
Software and hardware must work together	Increasing diversity of languages, platforms, hardware & systems must be made to work together	Systems of people, policies, sensors, software, hardware, etc., continuously learn ways to work together
Developers do nearly everything	Developers determine processes and rules and create automation	Machines continually learn what to do to achieve goals
Black box test for correctness	Formal analysis of correctness	Mathematically verified enforcers watch rest of system
Human in the loop (humans invoke computers)	Humans on the loop (humans monitor computers)	Humans out of the loop (computers notify humans only when needed)

Conclusions - Defense Innovation Board Software Acquisition and Practices (SWAP) Study – 11 Jan 2019

- **Software is ubiquitous and U.S. national security relies on software.** Well-equipped and well-trained warfighters provide the capability necessary to defend the nation, but software critically enables that mission. The ability to develop, procure, assure, and deploy software is central to national defense and integrating with allies and partners.
- **Speed and cycle time are the most effective metrics for software.** Software is a critical element of the Department's approach to executing missions, collaborating with allies, and managing its operations. DoD needs to deploy & update software at the speed of (mission) need and execute within the OODA loop of our adversaries to maintain advantage.

The **OODA loop** is the cycle observe–orient–decide–act, developed by military strategist and United States Air Force Colonel John Boyd. Boyd

Conclusions - Defense Innovation Board Software Acquisition and Practices (SWAP) Study – 11 Jan 2019

- **Software is made by people, for people, so digital talent matters.** DoD's (and commercial) current personnel processes and culture will not allow its military and civilian software capabilities to grow nearly enough. New mechanisms are needed for attracting, educating, retaining, and promoting digital talent, and providing the ecosystem that enables them to succeed.
- **Software is different than hardware (and not all software is the same)**. Hardware can be developed, procured, and maintained. Software is an enduring and evolving capability that must be supported and continuously improved throughout its lifecycle. The DoD (and Commercial) acquisition process and culture need to be streamlined for effective delivery and oversight of multiple types of software-enabled systems, at scale, and at the speed of relevance.

Biography

DR. KENNETH E. NIDIFFER, PMP
Director of Strategic Plans for Government Programs
Software Engineering Institute, Carnegie Mellon University

Dr. Nidiffer has over fifty-seven years of experience in the marketing, research, development, support, maintenance, and acquisition of software-intensive systems. His 24-year career in the U.S. Air Force (where he retired as a full colonel) is marked by several firsts in the area of software implementations, such as, first space-based compiler, first command-hardware in the loop simulation, a series of development/process standards, etc. From 1983-1986 he helped establish several noteworthy contributions, such as, the Software Productivity Consortium; the Software Project Management Program at the Defense Systems Management College; the George Mason Software Engineering Program and the Software Engineering Institute. At the Software Productivity Consortium, he launched the Consortium's business initiative in software process improvement, which became one of the largest programs in the world.

In 1991, Dr. Nidiffer left the Consortium to serve one of its founding members, Northrop Grumman, as Director of Systems Design and Development, Data Systems Division, and then as Director of Technical Operations, External Data Systems division, where he directed over 500 engineers and support personnel in the successful development of a variety of C4I, MIS/logistics, and high-speed computing applications.

Biography

In 1995, he joined Fidelity Investments Systems Company as Senior Vice President of Quality and Systems Assurance to lead a team of 165 professionals in implementing Total Quality Management, best-in-class software engineering processes, and the largest financial services test environment. He rejoined the Consortium in 1997 as Vice President for Business Development growing the membership from 50 to 100 members. In 2007 he joined the Software Engineering Institute and served as a principal senior engineer to focus on promoting key software engineering technologies that support government programs and retired in 2020.

Dr. Nidiffer has been widely published in the systems and software engineering community. He received his B.S. degree in Chemical Engineering in 1962 from Purdue University, Indiana, a M.S. degree in Astronautical Engineering in 1969 from the Air Force Institute of Technology, Ohio, a MBA degree from Auburn University, Alabama in 1975 and his D.Sc. degree from George Washington University, Washington D.C. in 1988.

He is a member of the Program Management Institute (PMI); the International Council on Systems Engineering (INCOSE); the Air Force Association (AFA); Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) and Member of the IEEE Professional and Activities Board (PAB); the Inter-National Committee for Information Technology Standards (INCITS)/Software and Systems Engineering (INCITS/SSE) Technical Committee, Senior Member of the American Institute of Aeronautics and Astronautics (AIAA); member of the National Defense Industrial Association (NDIA Systems Engineering Division); Chair of the NDIA/OSD (DDR&E) Industrial Software Committee and Co-Chair of the NDIA Systems Engineering Education and Training Committee.

Biography

Ken is a certified logistician; a Professor Emeritus of the Defense Systems Management College; Industry Advisor on George Mason's Computer Science Education Committee; a Project Management Professional; and an adjunct engineering professor in graduate engineering at George Mason University for over 28 years.

Dr. Nidiffer is a man of faith and a family-oriented person. He has been married for 57 years to the former Mary Emma Walsh of Havana, Florida and they have three daughters: Sheri, Kristi and Kathi and three grandchildren. In 2002 and in 2007, he was selected as the School of Information Technology's adjunct professor of the year in Software Engineering and received special recognitions for his GMU adjunct teaching service in 2009. 2013, 2017, 2018, 2019 and 2020.

GEORGE MASON UNIVERSITY
VOLGENAU SCHOOL OF INFORMATION TECHNOLOGY AND ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE

COURSE OVERVIEW
SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

- COURSE TITLE: Software Engineering Project Management (SWE 625)
- INSTRUCTOR: Professor Kenneth E. Nidiffer
- SEMESTER CLASSES: 25 Jan to 3 May 2021 , including turning-in final exam
- SEMESTER FINAL EXAM: Take Home
- CLASS TIME/METHOD: 1920 – 2200; on-line synchronous

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COURSE OVERVIEW
SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

- OFFICE HOURS: 1815 - 1900 Mondays;
  GMU.ZOOM.US/Sign-in

Meeting Arrangement Mechanisms:

- Establish a ZOOM meeting
- By appointment in on-line class session
- By the Internet – knidiffe@gmu.edu
- By setting-up a conference call
- By setting-up a video-teleconference (VTC)
- Department Administration Assistant
  - Ms. Michele L. Pieper: 703-993-1530

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COURSE OVERVIEW
SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

- CONTACT INFORMATION:
  - Internet/E-mail: knidiffe@gmu.edu – Best Method Overall
  - Oral Communication Mechanisms:

    - Method 1: (703) 217-0215 (Cell Phone) or Text Message – Good Method
    - Method 2: (703) 455-4021(Home Phone Number) - Good Alterative Method

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COURSE OVERVIEW
SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

TEXTS*:
Textbook No. 1: Title - Managing and Leading Software Projects
Dated: 2009; ISBN 987-0-470-29455-0
Textbook No. 2: Title – Systems Engineering of Software Embedded Systems. Dated 2019, ISBN 978-1-119-53501-0 – on-line copy will be provided
Author of Texts: Dr. Richard E. (Dick) Fairley
Publisher: John Wiley & Sons, Inc.
Options to Obtain:

1. Can Pick-up at University Bookstore (located in the George W. Johnson Center)
2. Order on-line
3. Obtained previously owned book

* Students are expected to study and understand the contents of the course text books

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COURSE OVERVIEW
SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

COURSE PREREQUISITES:

Undergraduate courses or equivalent knowledge in structured programming in a high-level language, data structures, discrete mathematics, and machine organization or assembly programming.

COURSE DESCRIPTION:

This course is concerned with processes involved in project planning; organizing; staffing; estimating; measuring and controlling; communication, coordination and leadership; and risk management. Topics covered include lifecycle delivery approaches; process and engineering product development models with special emphasis on the best practices contained in the Capability Maturity Model Integrated (CMMI©) constellations and product standards. The course also stresses the Program Management Institute's Program Body of Knowledge (PMBOK©) and the Software Engineering Body of Knowledge (SWBOK).

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SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

COURSE OBJECTIVES:

Upon completion of this course, students will know how to develop a software project management plan for software intensive systems; how to set up monitoring and control mechanisms; how to allocate and reallocate project resources; how to track schedule, budget, quality, productivity, and progress; understand the CMMI© frameworks and how to plan for the installation and sustainment phase of the system life cycle. They will understand the importance of the work breakdown structure and its relationship to the delivery lifecycle, resource planning and execution, and progress and product measures from both a project and enterprise perspective. In addition, they will understand the relationships among quality assurance, configuration management, verification and validation, and test and evaluation. They will also gain an understanding of the key issues in costing and pricing units of effort, motivation of workers, agile development, Secure DevOps, leading project teams, machine learning, ethics and total quality management.

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SOFTWARE ENGINEERING PROJECT MANAGEMENT 625

MAJOR TOPICS:

A taxonomy of management functions; corporate goals and objectives; system, project and product (functional and non-functional) requirements; architectural frameworks; best practice frameworks, such as the Adaptive Acquisition Framework (AAF), cost estimation techniques and models; software process development models with special emphasis on the CMMI© and software systems engineering delivery models; technical methods; documentation, quality assurance, configuration management, verification and validation, test and evaluation; staffing plans; monitoring and controlling mechanisms; standards (e.g. IEEE/EIA 12207 and IEEE Std. 16326™), policies and acquisition frameworks (i.e. Defense (e.g. DODI 5000.02, Defense Acquisition Guidebook (DAG) and Commercial (e.g. Infrastructure Service Provider (ISP) /Application Server Provider (ASP) frameworks; Platform as a Service (PaaS), Software as a Service (SaaS)), and procedures; work packages, schedules, budget, accounting systems, costing and pricing units of effort; risk management; post deployment software support; leadership, ethics, team building and total quality. Also, Defense Innovation Board (DIB) and Defense Science Board (DSB) findings will be addressed.

EVALUATION PROCEDURE:

Grades will be based on student homework, class contributions, student project, student project presentation, submission of articles and the final exam in the following proportions:

Class Contribution (Contributions In Addition to the Six Articles*)	10 %
Homework	10 %
Six Articles*	10%
Project	20 %
Student Project Presentations	10 %
Final Take Home Exam	40 %

Note: Final exam turn-in date: 3 May 2021

* Articles are to submitted on-line. Students can submit their articles at any time. Note: All articles will be accompanied with a one-page analysis of each article. Three articles are to be from refereed sources and three can be from any source.

Lecture Topics

Session	Date	Topic
1	25-Jan	Introduction to Project Management
2	1-Feb	Process Models for Software Development
3	8-Feb	Establishing Project Foundations
4	15-Feb	Plans and Planning
5	22-Feb	Project Planning Techniques
6	1-Mar	Estimating Techniques
7	8-Mar	Measuring and Controlling Work Products

Lecture Topics

Session	Date	Topic
8	15-Mar	Measuring and Controlling Work Processes
9	22-Mar	Managing Project Risk
10	29-Mar	Teams, Teamwork, Motivation, Leadership and Communication
11	5-Apr	Organizational Issues
12	12-Apr	Furture of Software Engineering and It's Impact on Society
13	19-Apr	Student Presentations
14	26-Apr	Student Presentations
15	3-May	FINAL EXAM RETURNED

Blackboard Learn

- Blackboard Learn (previously the *Blackboard* Learning Management System) is a virtual learning environment and course management system developed by *Blackboard* Inc.
- Used by George Mason University in support of online learning
- SWE 625 Course information and assignments are contained on Blackboard Learn
- SWE 625 online synchronous courses will use Blackboard Collaborate Ultra
- Key files are “Weekly Lectures” and Tools (Blackboard Collaborate Ultra)

Blackboard Learn

- Conduct of the Course SWE 625
  - SWE 625 is being offered as an online synchronous course this semester, Spring 2021
  - The normal class time are on Monday, 7:20 – 10:00
  - The course lectures will be conducted virtually using Blackboard Collaborate Ultra which can be accessed via logging into the 625-class using Blackboard and going to Tools at the start of class.
  - Students can gain access to the lecture and class materials (e.g., assignments) prior to the class via logging into the 625-class using Blackboard and going to Lectures
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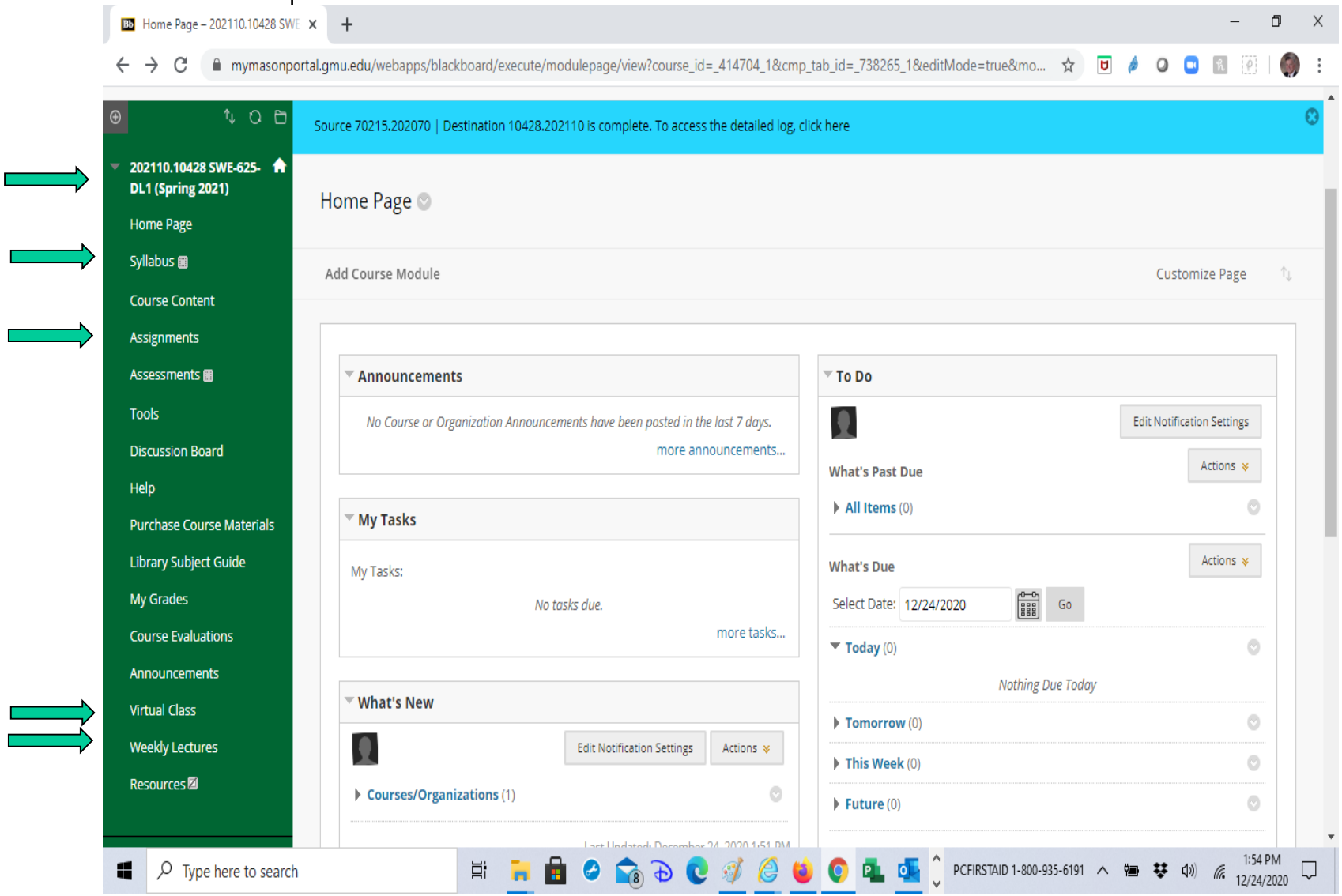
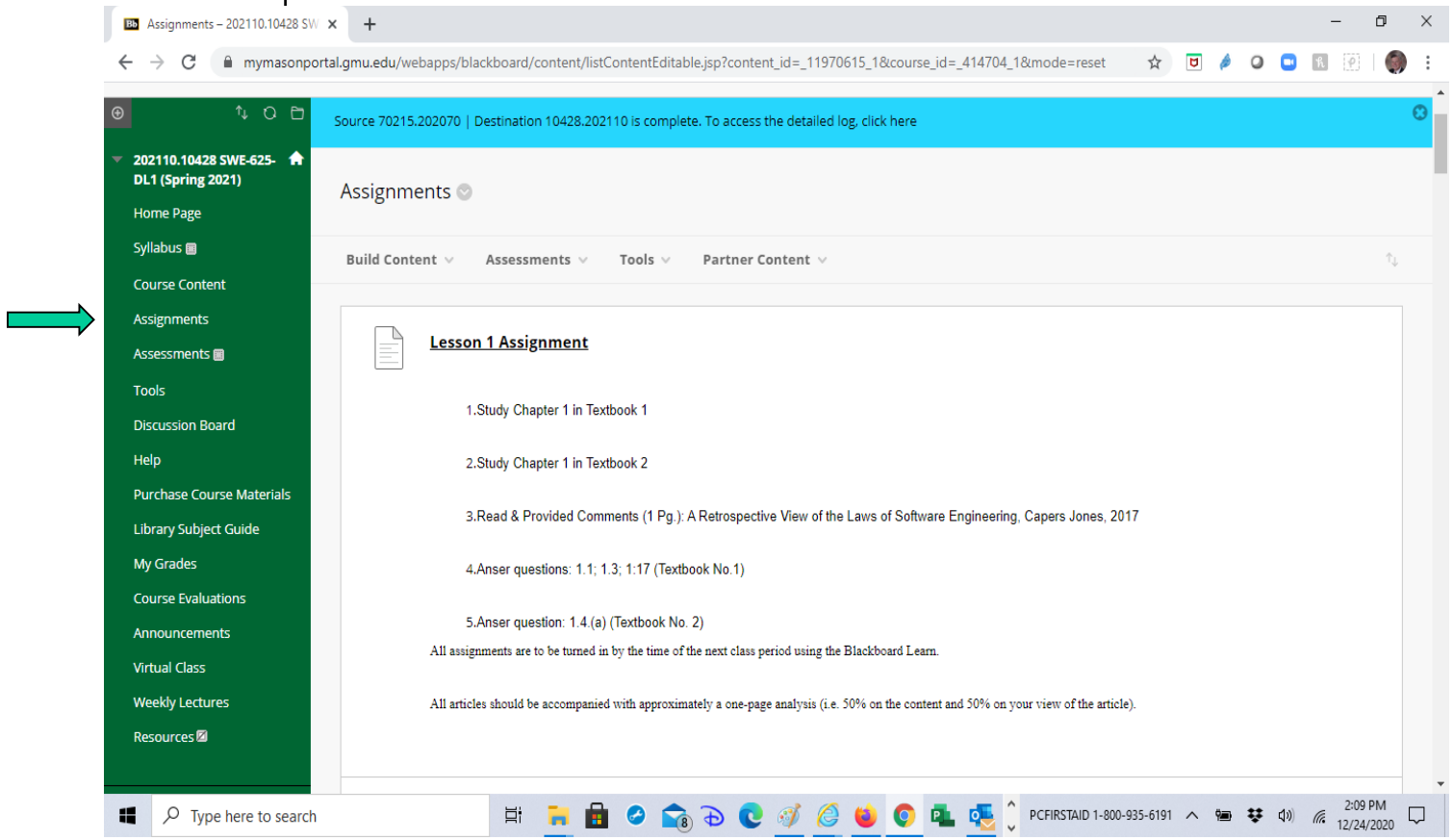
Blackboard Learn

Spring



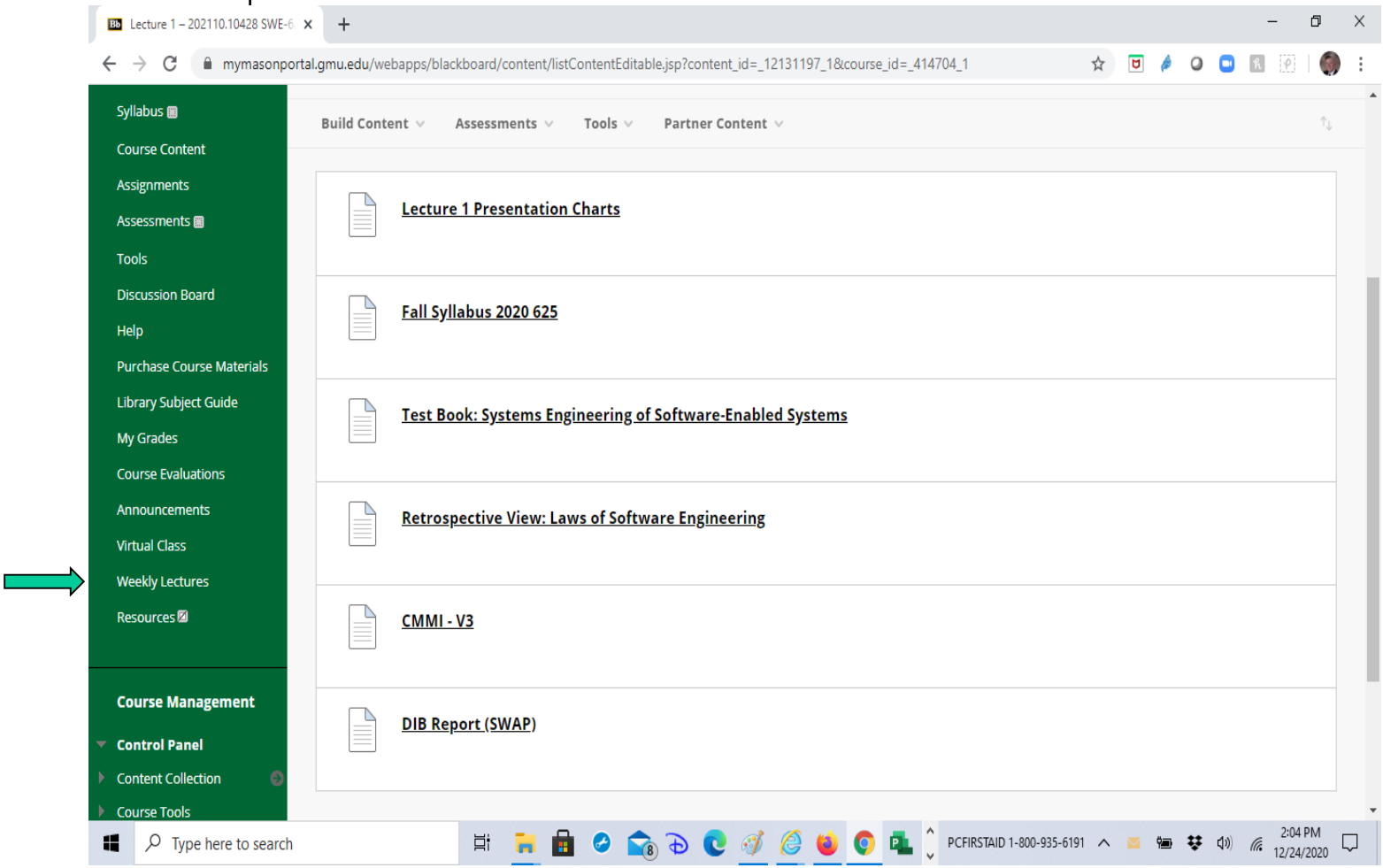
Blackboard Learn (Lecture 1 Assignments)

Spring



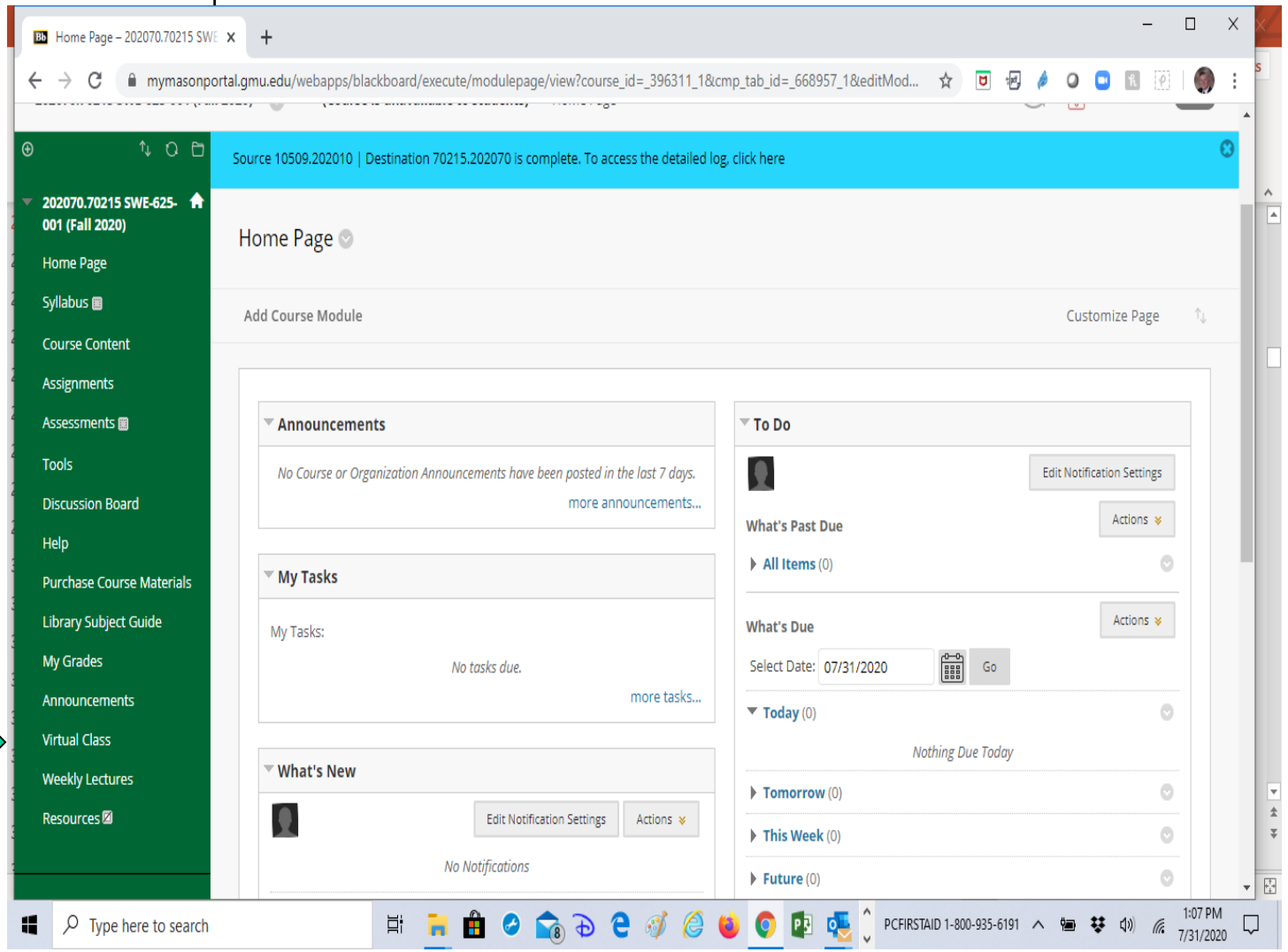
Blackboard Learn (Lecture 1 Asset Library)

Spring

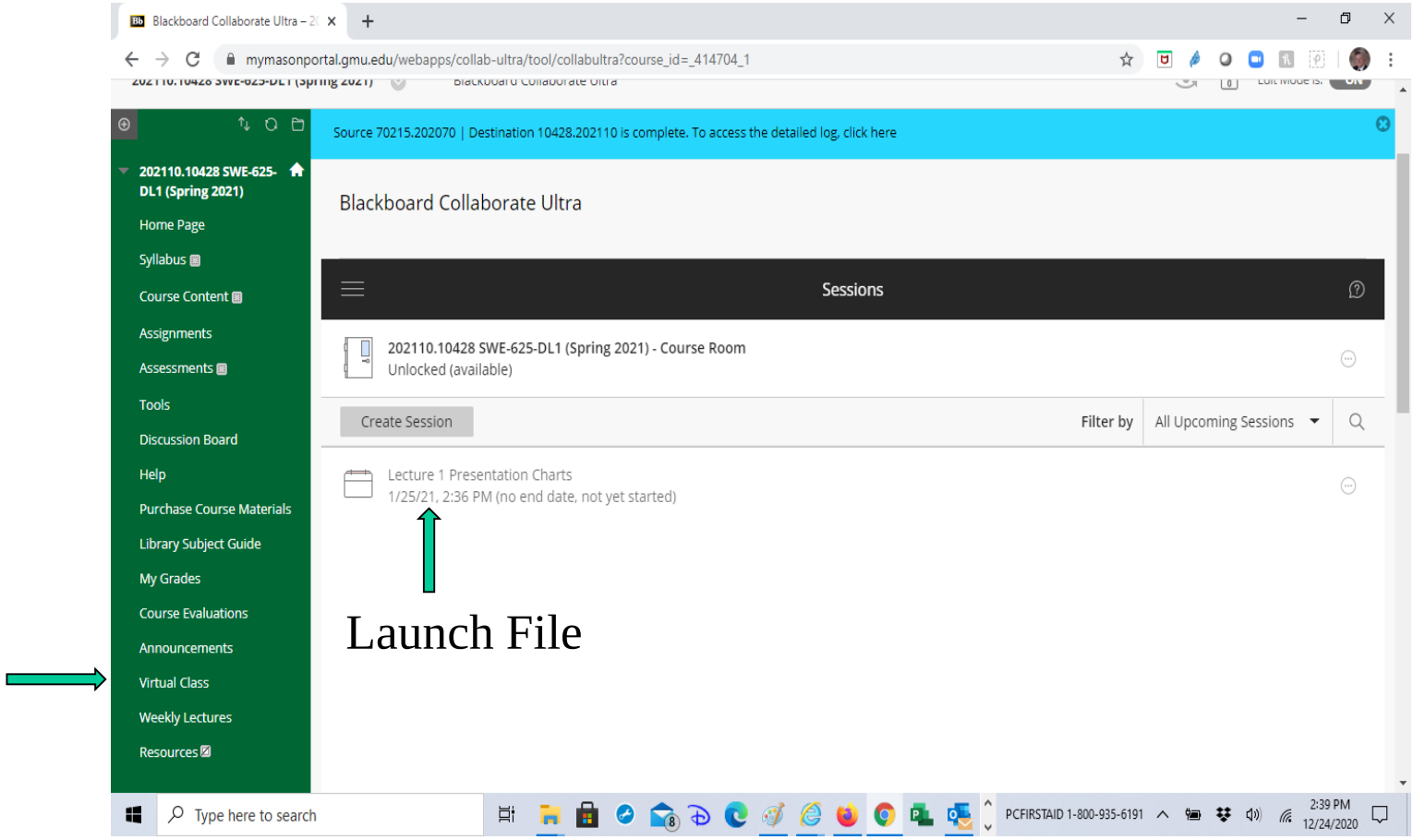


Blackboard Learn

Fall



Blackboard Learn



Sign-up for SWE 625 and Come Expecting to Experience One of the Most Career Beneficial Classes

- Successfully managing software intensive projects is a **priority** for the industrial, government and academic organizations
- The ubiquity of software and its critical role require fundamental shifts in software engineering management and engineering to maintain competitive advantage
- The course helps participants to **rapidly deploy innovation with confidence** within this shifting landscape by:
  - Applying new principles in software **engineering management for software intensive systems**
  - Developing new practices for **enabling business/mission capability with software innovation**
- **Equips students** in applying new management techniques in today's competitive job market