Sustainment of Cyber-Physical Systems – SYS 674

School of Systems and Enterprises

Meeting Times:	TBD
Classroom Location:	TBD
Instructor:	Eirik Hole
Contact Info:	ABS 225, ehole@stevens.edu, (201) 216 8308
Office Hours:	Tuesdays 1:00-3:00pm and Thursdays 2:00-3:00pm
Course Web Address:	On Canvas
Pre-/Corequisite(s):	SYS 671, SYS 672, SYS 673
Cross-listed with:	None

COURSE DESCRIPTION

This course focuses on managing the evolution of a cyber-physical system after its initial release to the market until its retirement. The course approaches this topic on three levels. The foundation is to put in place policies, processes and infrastructure to support, maintain and respond to quality issues for released instances of the system. The second level is to drive the evolution of the system's capabilities and characteristics based on evolving needs and enabling technologies. The third level is to proactively "disrupt" the market by reframing the opportunity and reinventing the system based on internal innovation, or responding to external disruptions in the marketplace or the technology space.

LEARNING OBJECTIVES

This course will provide the students with insights into issues pertaining to the life cycle sustainment of a cyber-physical system after its initial release to the market/customer(s). The main focus is to get a better understanding of how earlier decisions pertaining to system scope, conceptual-, architectural-, and detailed design, and technical decisions made throughout the first three courses impact the ability to effectively and efficiently:

- Operate, maintain, and support the system to provide the desired uptime and operational effectiveness
- Be able to analyze and assess architectures from the view point of reliability, maintainability supportability, and "evolve-ability" of a cyber-physical system.
- Evolve the system with capabilities/features and identify enabling technologies to stay ahead of the competition and accommodate emerging needs from current and new customers
- Identify opportunities and solutions for disruption and architectural innovation in the current market.

FORMAT AND STRUCTURE

The course is designed to be taught in an intensive 4-5 full day session, or in a classical 13-14 week semester setting.

The course is project-and interaction based. It is a natural succession of SYS 671, 672, and 673, and will continue the project work that is the backbone of the 4-course series. Each module will consist of short lectures intersperse with project exercises relevant to the concepts taught. Most exercises ends with ith a brief-out to the whole class followed by a discussion with their peers. Class participation is therefore crucial to achieve the desired learning.

The students will prepare 2 main assignments:

1. A Concept of Operations for the Maintenance and Support Enterprise including a conceptual design of the necessary infrastructure
    a. A Progress Presentation will be due at Mid-Term
2. A strategy for evolving the system over a 5 year horizon
    a. Including a Kick Off Brief for a ConOps team in project chartered to disrupt the marketplace.

COURSE MATERIALS

Textbook(s)/References:

[1]Product Design and Development, 5th Edition, by Karl Ulrich and Steven Eppinger. McGraw Hill, 2011. (General Reference)

[2] Agile Software Requirements, Lean Requirements Practices for Teams Programs and the Enterprise, by Dean Leffingwell, Pearson Education Inc., 2011

Other Readings: As assigned during class and posted on Canvas

GRADING PROCEDURES

Grades will be based on:

1.	Mid Term Progress Presentation	10%
2.	Sustainment ConOps Report	50%
3.	Strategy for System Evolution	40%
TOTAL		**100%**

IMPORTANT: There will be an anonymous peer-assessments of each team-members performance in the team. Based on this assessment, individual grades on the team project can be adjusted up to +/- 10%

Please note that assignments in this class may be submitted to www.turnitin.com, a web-based anti-plagiarism system, for an evaluation of their originality.

TENTATIVE COURSE SCHEDULE

Day	Module	Subject
1	0	Course overview and logistics
1	1	The business context of Sustainment/Integrated Logistics Support (ILS)
1	2	Fundamentals of ILS – System Reliability
1	3	Fundamentals of ILS – Maintenance and Maintainability
2	4	Fundamentals of ILS – Support and Supportability
2	5	Supporting the (Mission-) Operators
3	6	Support Maintenance Operations
3	7	Estimate required Capacity/Size of the Support Infrastructure
4		**Mid Term Presentation**
4	8	Manage the Flow of Work In Support Engineering
4	9	System Evolution – create Capability and Feature Roadmaps
4	10	System Evolution – create Technology Roadmaps
5	11	Introduction to Product lines and Product Platforms
5	12	Strategies for Disruption and Architectural Innovation

ACADEMIC INTEGRITY

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at http://web.stevens.edu/honor/

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"*I pledge my honor that I have abided by the Stevens Honor System*."

Reporting Honor System Violations
Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

EXAM ROOM CONDITIONS

The following procedures apply to quizzes and exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Room Conditions on the quiz or exam.

1. Students may use any devices devices during quizzes and/or exams.

2. All exams are open book.

3. Students are not allowed to work with or talk to other students, in class or outside, during quizzes and/or exams.

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. Student Counseling and Disability Services works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, and psychiatric disorders in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from SCDS staff. The SCDS staff will facilitate the provision of accommodations on a case-by-case basis. These academic accommodations are provided at no cost to the student.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the office of Student Counseling, Psychological & Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/sit/counseling/disability-services. If you have any questions please contact:

Lauren Poleyeff, Psy.M., LCSW - Diability Services Coordinator and Staff Clinician in Student Counseling and Disability Services at Stevens Institute of Technology at lpoleyef@stevens.edu or by phone (201) 216-8728.

INCLUSIVITY STATEMENT

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in education and innovation. Our community represents a rich variety of backgrounds, experiences, demographics and perspectives and Stevens is committed to fostering a learning environment where every individual is respected and engaged. To facilitate a dynamic and inclusive educational experience, we ask all members of the community to:

- be open to the perspectives of others
- appreciate the uniqueness their colleagues
- take advantage of the opportunity to learn from each other
- exchange experiences, values and beliefs
- communicate in a respectful manner
- be aware of individuals who are marginalized and involve them
- keep confidential discussions private