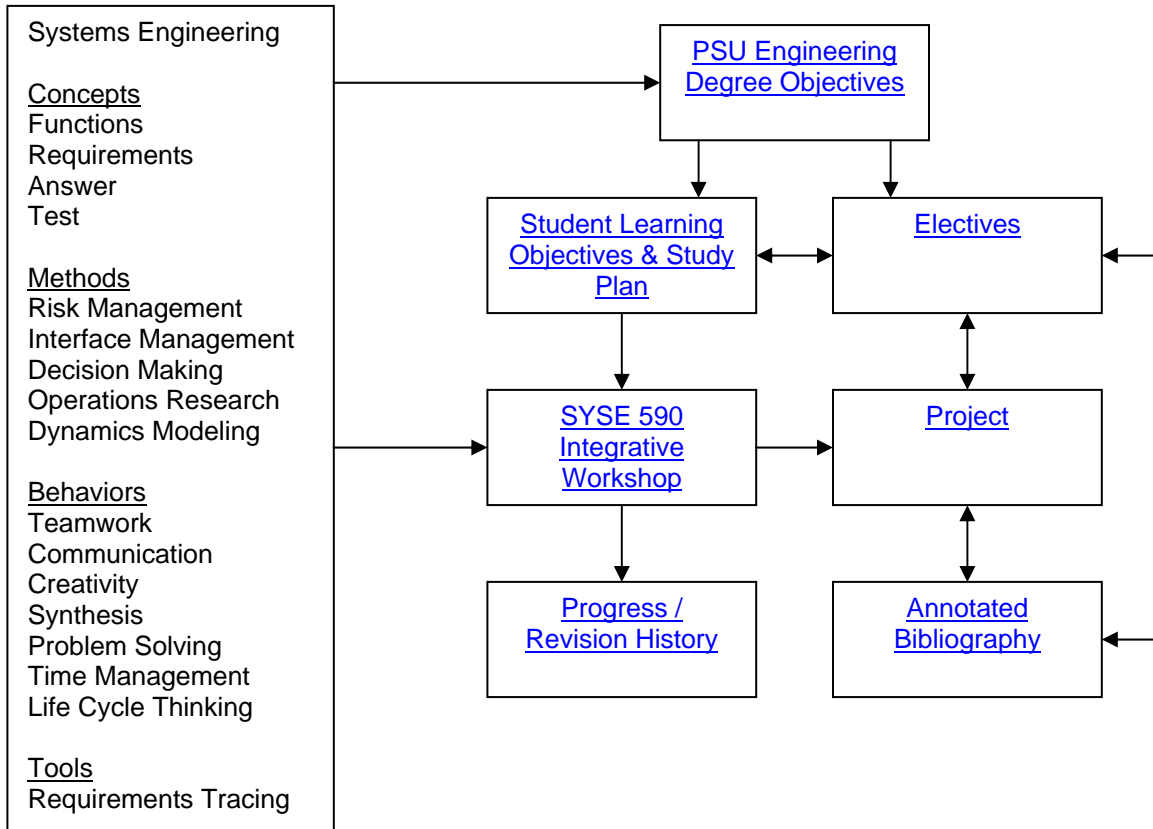


Systems Engineering Integrative Workshop Concept Map



The Masters of Engineering in Systems Engineering at Portland State University

Background

Systems Engineering focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then continuing with design synthesis and system validation while considering the complete problem: Operations--Performance--Test--Manufacturing--Cost & Schedule--Support--Disposal. Systems Engineering integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation. Many of us already practice systems engineering, but call it something else: design or development of product, process, and service. This course of study will enable the engineering to function in an interdisciplinary team and apply their area of engineering specialty toward the development of a product, process, or service.

Learning Objectives

Improve students' ability to engineer complex products, processes, or services.

Develop students' understanding of basic systems concepts and their application to the engineering life cycle.

Develop students' understanding of key systems engineering skills, including team building, communication, synthesis & creativity, problem solving, management of time and resources, database management, and life-cycle viewpoints.

Build on students' existing knowledge and project experiences by providing additional domain specialization or project management tied to systems engineering skills.

General Requirements

The course of study requires 45 credits all taken at the graduate level. The student will be under the supervision of the Director of Systems Engineering, and a faculty advisor from his department of specialty, and an industry advisor knowledgeable with the student's internship/project experience. Core courses will introduce the student to systems methods and its tools. Elective courses will provide advanced domain knowledge mostly in the student's area of specialty. Courses from other departments will enable the student to apply this domain knowledge in an interdisciplinary, integrated manner. The internship/project will be a capstone experience combining both systems engineering and domain-specific approaches in the engineering of a complex system.

Core Courses (16 Credits)

SYSE 591 Systems Engineering Approach (4 Credits)

EMGT 540 Operations Research (4 Credits)

SYSE 595 Hardware-Software Integration (4 Credits)

One of 3 modeling classes (4 credits):

SYSC 514 System Dynamics

SYSC 527 Discrete System Simulation

SYSC 529 Process Modeling and Simulation

Elective Courses (16 Credits)

Each student will be under the advisement of the Director of Systems Engineering and a faculty advisor from one of the following departments: Civil Engineering, Computer Science, Electrical & Computer Engineering, Engineering Management, Mechanical Engineering, and System Science. Elective courses will come from any one of these PSU departments based on a plan of study agreed upon by both advisors and the student. Courses from other universities may be acceptable, as evaluated on a case by case basis, and up to a limit of 15 credits. Systems Engineering courses are also available as electives.

Projects & Internships (9 Credits)

Each student will participate in an industrial experience either as part of a formal internship (SYSE 504) or as part of an industrial project (SYSE 506). These industrial experiences will involve the student, faculty advisors and an industrial advisor. The internship may be full time or part time with nine months of full time employment earning 9 credits. The internship/project must encompass systems level considerations as applied to a product, process or service requiring knowledge from multiple engineering disciplines.

Integrative Workshop (4 Credits)

A total of four credits of interactive workshop between faculty advisor and student are required. The student will be guided to consolidate their project experience and knowledge from elective courses with concepts from their systems engineering core courses. This interaction could be conducted on-line the Internet in SYSE 590 Integrative Workshop (IW). Two important concepts in Systems Engineering are integration and management of interfaces, related to both physical components and product development process. The objective of IW is for the student to exercise these concepts as applied to their course work and project work. The workshop will span the student's entire program under the guidance of an advisor, thus giving the time to achieve several goals. One, the student is given feedback as they apply discipline skills in systems settings. Two, the student will be asked to reflect on past approaches as it relates to newer more advanced systems skills. Third, the IW will review systems topics over several terms, thus reinforcing their use. In this way, behavioral change, from engineering specialty thinking to systems engineering thinking, will be achieved. The program also benefits because students continuously assess how well all courses INTEGRATE to achieve Systems Engineering education goals. Workshops will culminate in a student portfolio summarizing the academic knowledge and practical experience students gained while in the Systems Engineering program.

Summary from systems engineering web page at <http://www.cecs.pdx.edu/Systems/program/masters.html>.

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SYSE 590 Integrative Workshop

The focus of this project is a learning system, the application of system engineering in the K-12 education curriculum. The deliverables are twofold:

System Engineering for Kids – Tools for the 21st century

- 1) An in depth reflection on the role of system engineering in K-12 education using the First Lego League challenge as a example of a learning system.
- 2) A guide to the FLL competition, applied through the lens of system engineering using the FRAT approach.

Reflection on how item 2 benefited from my formal systems engineering exposure:

Summary from systems engineering web page at <http://www.cecs.pdx.edu/Systems/program/masters.html>.

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Electives

The purpose of this section is to record program electives and summarize their role in degree completion and learning objectives. The first paragraph of each summary, in quotation marks, is from the PSU catalog.

SYSC 514: System Dynamics (4 credits)

Professor: Wayne Wakeland

A lab and web-based course that introduces the student to the study of the dynamic behavior of continuous systems that contain feedback. Stella is the primary simulation language used in the course

EMGT/SYSC 553: Manufacturing System Simulation (4 credits)

Professor: Wayne Wakeland

The course focuses on using the ProModel discrete event simulation software to model manufacturing systems. Concepts include: a) overview of discrete system simulation and manufacturing simulation, b) data collection and prob. distributions, c) modeling material handling systems, d) job shop and production planning applications, and e) experimental design and output analysis. Relevant aspects of ProModel are also covered: locations, entities, processing logic, arrivals, path networks, resources, etc. For more information:

SYSC 5/610: Agent Based Simulation (4 credits)

Professor: Wayne Wakeland

This course focuses on the technical and theoretical aspects of agent-based programming. During this class students will learn how to use StarLogo to create agent-based models and use agent-based simulations in research and education. Reading assignments focus on the history and theories behind agent-based programming and the decentralized perspective.

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Project

The purpose of this section is to summarize work for credit towards SYSE 506 Project and its role in degree completion and learning objectives.

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Project

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Annotated Bibliography

The purpose of this section is to document works

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