Master of System Integration (MSI)

Course requirements
System Integration Curriculum

Overview

Complete the required courses from the following list:

- T40-511 System Engineering & Analysis*
- T40-521 System Design & Integration*
- T40-531 System Architecture*
- T40-542 Operations Analysis (Effectiveness, Engagement, Mission, Campaign Modeling, SoS Optimization)*
- T40-561 Affordability Engineering (Finance, Ops Analysis, Analysis of Alternatives)*
- T40-580 Capstone

*These courses are required to earn a Graduate Certificate in System Integration.

Electives

Complete twelve additional units to fulfill the requirements of the program.

- T40-543 System Safety Engineering (optional)
- T40-547 Reliability Engineering (optional)

Students can choose from a broad range of School of Engineering courses that are relevant to their study of System Integration. Please contact our academic advisor, Holly Stanwich to discuss elective options.
Course Descriptions Complete all of the following courses:

System Engineering & Analysis
**Total Units: 3.0**
This course covers the theory and practice of systems engineering. Students will learn the fundamentals of systems thinking, the systems engineering model, and key system engineering practices supporting the product life cycle: requirements development, trade studies, functional analysis and architecture, design synthesis, program planning, and program monitor and control. Additionally, this course will cover specialty engineering integration and students will gain a strong foundation in theory coupled with practical exercises that enhance the strong foundation in theory coupled with practical exercises that enhance the students’ understanding of the system engineering discipline.

System Design & Integration
**Total Units 3.0**
A practical examination of the later stages of the product lifecycle development through preliminary design, detailed design integration and test, system validation and verification. Analysis of physical design alternatives and applying methods from design analysis for selection of the system design. Includes design process, design disciplines and design practices.

System Architecture
**Total Units 3.0**
This course will introduce the student to project profiles, timeline and capability mapping. In addition to capability considerations of the architecture, this course will include: vision, capability, taxonomy, schema, phasing, dependencies and high level operational concepts. It will also provide the tools for developing the architecture for complex systems, along with reporting the architecture in the operational, technical and systems views.

Operations Analysis
**Total Units 3.0**
Examination of quantitative and managerial approaches for the planning, scheduling, and control of production and inventories in manufacturing companies. Review various models for demand forecasting, capacity planning, lot-sizing, scheduling, and shop-floor controls in various types of manufacturing environments. Analysis of techniques such as MRP II, JIT, and Kanban in production scheduling and control.

Affordability Engineering
**Total Units 3.0**
This course will introduce the discipline of Affordability as a fundamental element within Systems Engineering and Project Management. We will explore the application of analytical and simulation methods to better understand and predict the Life Cycle Cost (LCC) of a system/project and to balance cost, performance and risk for a system while in the development phase of its Life Cycle. The course will cover an introduction to analysis of alternatives and cost-effectiveness trade-offs aimed at delivering best-value, market-competitive solutions to the customer. The student will discover Affordability strategies, techniques and tools used to influence decision makers and customers, and gain a competitive advantage over competitors. Students will analyze case studies exploring system trade-offs and decisions which impact the project’s value to stakeholders, Life Cycle Cost and cost risk; and effectively present their findings. Prerequisite: Program Director or Instructor approval.

Capstone
**Total Units 3.0**
The capstone project incorporates systems engineering concepts, processes and products including the lessons learned through the coursework to demonstrate student’s mastery of systems integration and analysis techniques. Students will work in multidisciplinary teams, delivering a final product that applies their cumulative coursework within a context of a real industry project.
Electives:
Complete twelve additional units to meet program requirements:

Systems Safety Engineering
Total Units: 1.5
System Safety Engineering is the disciplined approach to assuring the safety of a product within the context of its operation within a defined environment. The curriculum includes an overview of the discipline, and a detailed review of the eight elements of system safety engineering. Among these eight elements are hazard identification, assessment of risk, identification of mitigations, and verification & validation of final design. We review traditional safety analysis methods including functional hazard analysis, common mode analysis, event tree analysis and fault tree analysis. Classroom exercises reinforce the student’s understanding of these methods. Methods discussed include those used within Defense programs as well as those used in commercial aerospace, transportation, and the medical industry. Comparison of these methods and rationale for these differences will be explored.

Reliability Engineering
Total Units: 1.5
Reliability Engineering is the disciplined approach to assuring the reliable design and operation of a product within the context of its defined environment. The curriculum includes an overview of the discipline, and a detailed review of the elements of reliability engineering. Among these elements are related disciplines that impact inherent design, sources of information that can be used to evaluate the reliability of proposed design, architecture of systems to enhance reliability, and verification & validation of final design. Additionally, the impacts of reliability on the operational use of the system will also be covered. Classroom exercises reinforce the student’s understanding of these methods. Methods discussed include those used within Defense programs as well as those used in commercial applications. Comparison of these methods and rationale for these differences will be explored. Prerequisite: Professor consent.

If you have questions, contact us at:
Washington University
School of Engineering & Applied Science
Lopata Hall, CB 1220, 1 Brookings Drive, St. Louis, MO, 63130
Phone: (314) 935-5455, Fax: (314) 935-5449
engineeringgradadmissions@wustl.edu