SYSTEMS ENGINEERING

College of Natural and Behavioral Sciences
Department of Physics

Program Description

The MSSE program at CSUDH provides students with the latest, cutting-edge skills and design methods for the realization and management of the complex, interdependent systems required to develop and maintain today's products and systems in rapidly changing environments. These include Model-Based Systems Engineering, Systems Architecting, System-of-Systems Engineering, and Complex and Resilient Systems. The curriculum balances theory with practical projects and case studies, enabling students to understand and implement applicable models to enhance and complement systems engineering activities throughout a project's life cycle.

The CSUDH MSSE program draws upon case studies, methodologies, and tools from several engineering industries, providing experienced professionals as well as those new to the field with exposure to real-world systems engineering case studies. Students access contextualized case studies within their industries and complete their degree with a culminating project that prepares them for complex, real-life projects.

Students will learn how to apply systems engineering knowledge and techniques to problems from the automotive, commercial aviation, defense, electronic communications, and space industries. They will learn the importance of implementing Model-Based Systems Engineering in the development of complex, interdependent systems that may be comprised of a combination of legacy and new components.

Features

The MSSE program was established in response to regional and national workforce needs. Systems engineers possess analytical skills required to support a broad range of job functions: from the development of systems that facilitate split-second trading on Wall Street to the integration of satellite surveillance systems that support the collection, analysis, and fusion of heterogeneous multimedia sources.

The MSSE program is a Practitioner's program. Assignments are based on case studies and conventional exams are not administered in most courses. Instead, students propose solutions to Engineering Design Challenges (EDCs). An Engineering Design Challenge requires a student to apply theoretical concepts to a problem characterized by specific technical, fiscal, and operational constraints. Depending upon the complexity of the EDC, students will be allowed 3-10 days to develop a solution. The product of each EDC becomes part of the student's graduate project portfolio.

Students in many degree programs may not begin to develop their projects/theses until the end of their curriculum. The MSSE curriculum employs a model that allows students to develop their projects incrementally. Each semester students enroll in a 1-unit course entitled Systems Engineering Project Phase (I, II, III, and IV). The product of each of these courses corresponds to a chapter in the final project report. This approach facilitates the organic development of the project because each project component builds upon work completed during the previous term.

Admission Requirements

The admission requirements for the MSSE Degree Program are as follows:

- A **STEM-focused bachelor's degree** from a fully accredited institution.
- **Good standing** at the last institution attended.
- A **grade point average (GPA) of at least 2.5** on the last degree completed or at least 2.5 in the last 60 semester (90 quarter) units attempted.

Depending on the type of the undergraduate degree held, the applicants may be admitted with either a **classified or conditional admission status**.

Classified Admission: In order to be admitted with a classified status, the applicant must meet all general admission requirements and hold a bachelor's degree in a STEM field.

Conditional Admission: Applicants holding bachelor's degrees in the fields not related to STEM may be considered for a conditional admission and may have to fulfill additional requirements before they attain a classified status. These additional requirements will be determined by evaluating applicant's transcripts and work-related experience. The student must earn a minimum grade point average of 3.0 during the first semester of attendance.

Graduate applicants, regardless of citizenship, who do not possess a bachelor's degree from a postsecondary institution where English is the principal language of instruction or who have not attended schools at the secondary level or above for at least three years full-time where English is the principal language of instruction must present one of the following:

- A minimum score of 80 on the internet-based TOEFL exam (iBT),
- A minimum score of 213 on the computer-based TOEFL exam
- A score of 6.5 or higher on the IELTS Academic Test, or
- A score of 53 or higher on the Pearson Test of English (PTE) Academic

Graduate applicants who have met all admission requirements except English Proficiency may apply for conditional admission through the CSUDH American Language and Culture Program (ALCP). Once they have improved their English skills and pass TOEFL/IELTS OR qualify for an ALCP English Proficiency Waiver, they can start their degree program.

Admission Procedures

The following materials are required for admission review by the submission deadline: **Please note that the cut-off date for admission to the Fall Term is June 1. Applications are not accepted for the Spring or Summer Terms.**

Please note: **do not be confused by the Admissions Office dates; the dates they state apply for on-campus courses only**. Internet Terms are not the same as the on-campus terms. The applicant must have been accepted to the university before the first class meeting in order to be considered a graduate student in the MSSE program rather than an open enrollment student or an Extended Education student. Students accepted after the first class meeting will not be able to enroll in courses, and their acceptance will be revoked for non-attendance by the Admissions Office. At this point, you will need to re-apply with a new application for the next term.

Academic Advising

Students will be advised once each semester, prior to registration. Students develop their capstone projects incrementally, beginning in their first term. Student research progress will be reviewed during each academic advising session.

Departments, Professional Organizations, and Co-curricular Activities

The CSUDH Science Society, Society of Physics Students and Sigma Pi Sigma (National Physics Honor Society) cooperate in offering lectures, social programs and field trips to promote student participation in and enjoyment of the sciences. These activities are enriching and greatly enhance our students' growth within our community of scholars. In addition, faculty are often willing to sponsor inexpensive student memberships in national physics organizations that publish ongoing research in various areas of physics and engineering. The department sponsors a colloquium series with talks a few times each semester on various topics in physics and engineering.

Career Possibilities

Systems Engineering has been implemented in nearly every field, including:

- Aerospace
- Automotive Design and Manufacturing
- Biotechnology
- Counter-Terrorism
- Critical Infrastructure
- Cyber Security
- Defense
- Environmental/Green Engineering
- Healthcare
- Homeland Security
- Manufacturing
- Next Generation Farming
- Oil and Gas
- Power and Energy Systems
- Quality Assurance
- Safety/Security Engineering
- Social Network Systems Architecture
- Space Systems
- Telecommunications
- Transportation

Graduate Programs

Master

- Systems Engineering, Master of Science (https://catalog.csudh.edu/academics/systems-engineering/systems-engineering-ms/)

Faculty

Ximena C. Cid, Department Chair
Antonia Boadi, Horace Crogman, James (Jim) Hill, John W. Price

Department Office: NSM B-202, (310) 243-3591

Full-Time Staff

To Dang, Technician
Christina Trujillo, Office Manager

Emeritus Faculty Courses

Michael Durand, Kenneth Ganezer, H. Keith Lee, Samuel L. Wiley

Courses

SEE 501. Systems Engineering Project Phase I. (1 Units)
Co-requisite: SEE 510 required. Introduction to systems thinking, systems engineering core body of knowledge and engineering problem solving methodologies. Case studies involving complex, large scale systems.
Offered Fall

SEE 502. Systems Engineering Project Phase II. (1 Units)
Prerequisites: SEE 501 and SEE 510 required. Presents relevant theoretical perspectives, best practices, tools and methodologies related to the engineering of complex systems and systems-of-systems.
Offered Spring

SEE 503. Systems Engineering Project Phase III. (1 Units)
Presents ascendant systems engineering methodologies and tools.
Offered Fall

SEE 504. Systems Engineering Project Phase IV. (1 Units)
Prerequisite: SEE 503, SEE 550, SEE 560, SEE 570 required. Co-requisite: SEE 520 and SEE 580 required. Modeling and simulation, statistical decision and risk analysis, systems architecture and quantitative methods.
Offered Fall

SEE 510. Introduction to Systems Engineering. (3 Units)
Co-requisite: SEE 501 required. Theoretical and practical foundations of systems engineering; processes, tools and principles employed throughout a system's life cycle: from concept inception through system retirement/disposal.
Offered Fall

SEE 520. Analytics in Systems Engineering. (3 Units)
Prerequisite: MAT 131 or MAT 321 or an introductory course in statistics, and CSC 121 or an introductory programming, and SEE 502, SEE 550, SEE 560. Statistical methods used in data analytics with a focus on decision making in engineering applications.
Offered Fall

SEE 530. Quantitative Methods in Systems Engineering. (3 Units)
Prerequisite: MAT 131 or MAT 132 or an introductory course in probability and statistics and SEE 510. Probability and statistics for engineering project cost estimates, system risk assessments, life cycle models and management plans.
Offered Spring

SEE 540. Economic Factors in Systems Engineering. (3 Units)
Co-requisite: SEE 510 required. Principles of engineering economics; impact of economic factors for systems engineers, tools for understanding and analyzing these factors, fundamental quantitative analysis of cash flow, system life-cost estimating; parametric cost models.
Offered Fall

SEE 550. Modeling and Simulation. (3 Units)
Prerequisite: SEE 530 required. Application of computer simulation to engineering (sub)systems; systems structure, system analysis, model construction, data collection, and computer simulations tools.
Offered Summer

SEE 560. Model Based Systems Engineering. (3 Units)
Prerequisite: SEE 530, SEE 540, SEE 550. Co-requisite: SEE 550 required. Application of model curation, model repositories and model integration in MBSE; distinction between engineering models and model-based systems engineering is emphasized.
Offered Summer

SEE 570. Complex Systems Architecture. (3 Units)
Prerequisite: SEE 510 required. Holistic approach to the process of architecting systems in various engineering disciplines.
Offered Spring

SEE 580. System-of-Systems Engineering. (3 Units)
Prerequisite: SEE 550, SEE 560, SEE 570 required. Critical issues associated with the integration of systems and/or systems-of-systems.
Offered Fall

SEE 585. Engineering Complex Systems. (3 Units)
Prerequisite: SEE 570 and SEE 580 are required. Concepts and methods for the design and analysis of complex adaptive and resilient systems/systems-of-systems.
Offered Spring

SEE 590. Master's Project. (3 Units)
Prerequisite: SEE 504, SEE 505 (may be taken concurrently) and consent of graduate advisor. Co-requisite: SEE 585 required. Individual research on a systems engineering topic under the direction of graduate faculty. Repeatable course.
Offered Spring

SEE 600. Graduate Continuation Course. (1 Units)
Prerequisite: Signature of graduate program coordinator required. Graduate students, who have completed their course work but not their thesis, project, or comprehensive examination, or who have other requirements remaining for the completion for their degree, may attain continuous enrollment by enrolling in this course.