The Department of Systems Engineering

ALL SYSTEMS GO!

Mahan Hall
United States Military Academy
West Point, New York 10996

What is Systems Engineering?

Systems are all around you! The world is a network of systems that provide us with food, water, shelter, transportation, and the technology we need to manage our daily lives. Without these systems, life as we know it would not be possible. The same logic applies in Systems Engineering.

The Department of Systems Engineering (DSE) studies technical and human components, civilian and military components, land/sea/air based components and how each of these acts as a system. For example, a helicopter is a system. The components of that helicopter – the pilot, rotor, navigation system, power train, etc – must all work together so the helicopter can perform its mission. The system performs a function that a single component cannot.

Systems Engineers study contemporary issues facing the military and industry. They help clients and senior leadership identify problems, assess risks, save resources and test new ideas to avoid major mistakes before large scale systems are implemented.

Typical Systems Engineering problems and applications include but are not limited to:

- Combat Simulation
- Decision Support Systems
- Economic Systems Analysis
- Environmental Protection and Pollution
- Force Effectiveness and Integration
- Infrastructure Renewal and Maintenance
- Management Information Systems
- Military Planning and Project Management
- Resource Allocation and Management
- Systems Acquisition and Management

Relevant Now and in the Future

Systems engineering and its disciplines are the future of the military. Military service under the current provisions of force transformation is described as joint operations involving Army, Air Force, Navy and Marine Corps units. Systems Engineers work with these types of systems.

In the private sector, the integration and importance of systems thinking is rapidly expanding, making Systems Engineering not only a dynamic field, but a rapidly growing one. The study of systems has far reaching implications on technology, business, government, medicine and more.

Systems Engineering

Technology and Training

DSE is the only undergraduate department in the nation which offers education and training compatible with the same technology utilized in the Army and industry today.

The research and education environment consists of 4 lab facilities:

- The Lifecycle Acquisition Management Institute (LAMI) – also called "the Cave"
- Information Visualization Laboratory (IVL)
- Combat Simulation Lab
- Systems Methodology and Design Lab (SMDL)

These labs provide an immersive environment to model, simulate and study visualization issues, human interaction within environments and investigate system performance. This robust learning and research environment is used to educate cadets and officers about how to gather, synthesize, display, and analyze the many types of information they will encounter as military leaders.

Real World Problems. Real World Clients. Real World Application.

To illustrate the importance and application of systems thinking outside of the classroom, cadets have the unique opportunity to complete their undergraduate study with a real world client. **AIADs** are similar to summer internships in which cadets work with military and civilian systems engineers, operations research analysts, and scientists. DSE offers more than 50 AIAD opportunities with DoD, DA and industry clients such as Boeing and Raytheon. AIAD locations vary throughout the United States, Central America, Europe, Asia and Australia. **Capstone** projects are typically two semesters in which cadets analyze a systems engineering problem for a client. Some AIADs and Capstones overlap.

Graduate School Preparation

DSE faculty members are educated at the best universities in the country including Stanford, M.I.T., Duke, Columbia, University of Virginia, University of Arizona, University of Texas, and the Georgia Institute of Technology. Faculty will help prepare cadets for a variety of graduate programs such as Business, Engineering, Science, Math, Technology, Public Affairs, Medicine, Law, Human Resources, and more. No matter what the career field, cadets will be able to apply knowledge of the systems process to solve serious problems confronting leaders.

Contact Us or Visit Us on the Web

Since 1989, DSE has developed technologically savvy engineering leaders of character and prepared them to be expert problem solvers for the Army, industry and government. Contact us to learn more.

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DSE Program Highlights

Systems Engineering includes all systems of interest and is naturally multi-disciplinary. DSE offers five program majors: Systems Engineering, Engineering Management, Information Engineering, Systems Management and Operations Research (in conjunction with the Math Department). We also offer a Core Engineering Sequence for non-engineering majors.

Systems Engineering (SE)

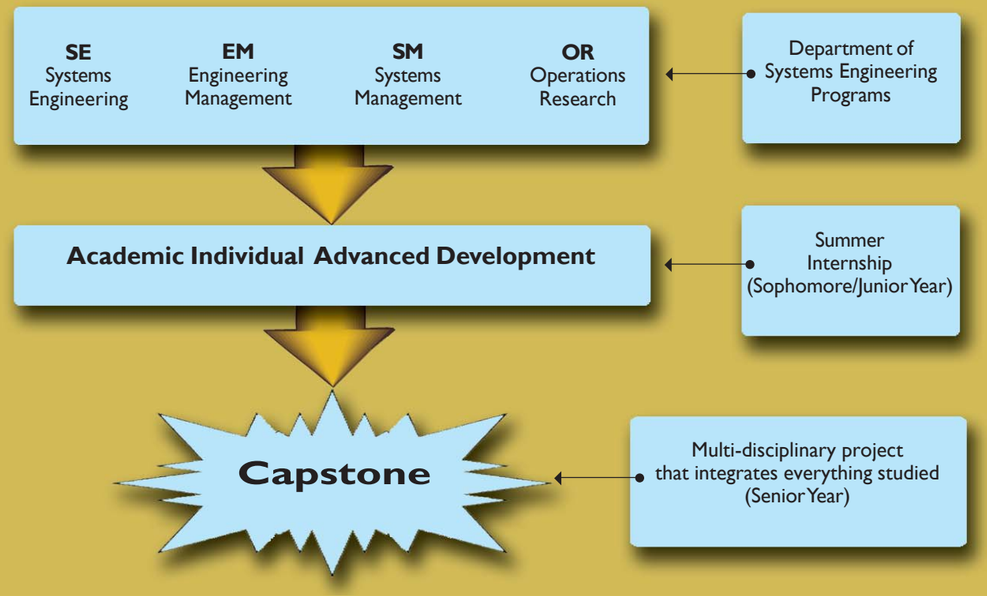
- ABET Accredited Program
- Provides in-depth study of Systems Engineering
- Applies engineering principles to understand real world problems
- Prepares cadets for the everyday challenges an Army officer encounters
- Provides the foundation for a wide spectrum of graduate degrees

Engineering Management (EM)

- ABET Accredited Program
- Ranked #1 Engineering Management Program in the Nation by the American Society for Engineering Management (ASEM) in 2005 and 2006
- Multidisciplinary program with in-depth instruction in engineering, finance, accounting, management and leadership
- Excellent undergraduate major that will prepare you for virtually any graduate program

Systems Management (SM)

- Develop and apply the technical, business, communication, and leadership skills necessary to manage complex processes found in the military and private sector
- Provides the foundation for advanced degrees in business, operations research, systems engineering, information systems management, engineering management, network systems management and more.
- Enrollment affords a membership opportunity with the Professional Management Institute (PMI)
- Major requires a total of 40 courses allowing cadets to pursue a minor (or possibly another major) without overloading a semester



Operations Research (OR)

- Incorporates math and systems engineering in analyzing and solving real-world problems
- Designed for cadets with strong mathematical abilities
- Applies quantitative methods to decision making across several disciplines
- This program is sponsored jointly with the Department of Mathematics

Core Engineering Sequence

- Provides an introduction to the concept of "systems thinking" and the strategies leaders implement to solve problems, manage programs and make decisions in any military or business environment
- Great engineering foundation for non-engineering majors
- Teaches critical thinking, decision making, and analysis skills

Cadet Chapter Professional Societies

- American Society of Engineering Management (ASEM)
- International Council of Systems Engineering (INCOSE)
- Institute for Operations Research and Management Science (INFORMS)
- Military Operations Research Society (MORS)
- Project Management Institute (PMI)
- Phi Kappa Phi Honor Society
- Epsilon Mu Eta Honor Society
- Omega Rho Honor Society

Cadets working in the Visual Modeling and Simulation Lab (VMSL)

Accolades

From the Department of Homeland Security…

"I am pleased to have the opportunity to formally express our appreciation of your outstanding work to develop a unique quantitative model for measuring the resilience of a metropolitan area. You took on the challenge to integrate both hard metrics, such as critical infrastructure services, and soft metrics, such as social and political circumstances, in your model formulation. I applaud your dedication and creativity in developing this model and your active engagement of knowledgeable stakeholders and subject matter experts within the Directorate and elsewhere. You should feel justifiably proud to have made such an excellent contribution to the homeland security of your Nation so early in your careers."

-George Foresman,
Undersecretary for Preparedness
Department of Homeland Security, May 2006

SE Majors at Work…

"I am currently the S3 of 1-502d in the 101st. I have been asking several of my SE graduates to solve some of the problems we are facing as we deploy. One recent problem they solved for me included developing a 'troop to task' program that computes man hours required to conduct missions based on assumptions we developed. Using the program, I can tell my BN commander how many hours per day he can ask our troopers to work and still conduct the required number of missions. We identified that the difference between a 12 hour day and a 16 hour day is about a company's worth of Soldiers across our BN AO.

Another problem is generating random routes within my BN AO. We will be operating in an area where the threat of IEDs is high. Generating random patterns for our patrols, re-supply convoys, OP Locations, route recon missions, etc. becomes taxing and ultimately leads to a less than random pattern. Using SE, we can develop a program that will help to randomly select routes, OP locations, etc., … to help ensure we remain relatively random with our patrols."

-MAJ Rob Salome, September 2005