

# DEPARTMENT OF SYSTEMS ENGINEERING AND OPERATIONS RESEARCH

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The Systems Engineering and Operations Research (SEOR) Department offers a bachelor's degree in systems engineering (<http://catalog.gmu.edu/archives/2020-2021/colleges-schools/engineering/systems-operations-research/systems-engineering-bs/>), a minor in systems engineering (<http://catalog.gmu.edu/archives/2020-2021/colleges-schools/engineering/systems-operations-research/systems-engineering-minor/>), a minor in aviation flight training and management (<http://catalog.gmu.edu/archives/2020-2021/colleges-schools/engineering/systems-operations-research/aviation-flight-training-management-minor/>), a master's degree in systems engineering (<http://catalog.gmu.edu/archives/2020-2021/colleges-schools/engineering/systems-operations-research/systems-engineering-ms/>), a master's degree in operations research (<http://catalog.gmu.edu/archives/2020-2021/colleges-schools/engineering/systems-operations-research/operations-research-ms/>), and a doctoral degree in systems engineering and operations research (<http://catalog.gmu.edu/archives/2020-2021/colleges-schools/engineering/systems-operations-research/systems-engineering-operations-research-phd/>). The department also offers a concentration in predictive analytics and a concentration in financial engineering within the school-wide master's degree in data analytics engineering. In addition, the department offers six systems engineering certificates at the master's level: architecture-based systems integration, C4I and cyber (command, control, communications, computing, intelligence, and cyber), engineering resilient enterprise systems, communication and networking, tactical computer operations, and financial systems; the department offers three operations research certificates: computational modeling, military operations research, and predictive data analytics. The department also offers a dual master's degree in operations research and master's degree in statistical science jointly with the Statistics Department.

There is much overlap between systems engineering and operations research. The department encourages students of either discipline to elect courses in the other. For more information, go to the department's website (<http://seor.gmu.edu/>).

## Systems Engineering

Systems engineers determine the most effective ways to use all of a system's components: people, machines, materials, information, and energy. The engineers plan, design, implement, and manage integrated systems, working to ensure performance, safety, reliability, and maintainability. They also work to ensure that systems are delivered on time at a reasonable cost. Examples of systems include the national air transportation system, computer networks, autonomous vehicles, intelligent robots, the electric power grid, healthcare systems, and financial trading systems. Whereas other engineering disciplines concentrate on individual aspects of a system, such as electronics, ergonomics, or software, systems engineers focus on the system as a whole and the interaction of the underlying parts. Systems engineering, perhaps more than any other engineering discipline, is involved with the

human and organizational aspects of developing the desired system. Systems engineering is the people-oriented engineering profession.

## Operations Research

Operations research is the professional field that uses analytical and data-based methods in engineering to support management decision making, often focusing on how best to allocate limited resources. Operations researchers do for organizations what physicists do for the physical world: they try to find order in apparent chaos by identifying the structure in complex situations and understanding how the components of organizations interact. The goal is to explain and predict the effects of actions taken on these systems and to use the information to make informed management decisions. Much of this work is developing and manipulating mathematical and computer models of organizational systems, frequently making use of big data to build and run the models.

## Faculty

### Faculty Professors

Adelman, Brouse, Chang, Chen, Hoffman, Laskey, Nash, Pyster, Shortle (chair), Sofer, Zaidi

### Associate Professors

Baldo, Clemons, Costa, Ganesan, Huang, Jones, Loerch, Sherry, Xu

### Assistant Professors

El-Amine, Ji, Sokolov

### Research and Affiliate Professors

Miller-Hooks, Wagner, Wolman

### Adjunct Professors

Arab, Bailey, Barry, Burke, Charbonneau, Comer, Dam, Edson, Ferreira, Guharay, Hashim, Icore, Keltz, Killam, Laveson, Maxwell, Morris, Mulhearn, Nicholas, Ray, Rothwell, Stimpson, Vermillion, Warren, Wieland, Woodaman, Xie

### Emeritus Faculty

Donohue, Palmer

## Programs

- Aviation Flight Training and Management Minor
- Operations Research and Engineering Graduate Certificate
- Operations Research, MS
- Systems Engineering Graduate Certificate (SEOR)
- Systems Engineering Minor
- Systems Engineering and Operations Research, PhD
- Systems Engineering, BS
- Systems Engineering, MS