GEORGE MASON UNIVERSITY

Advanced Transportation Systems (ATS) Concentration Area

Master of Science in Systems Engineering
        or
Master of Science in Operations Research

Transportation is one of the most important and increasingly complex infrastructure networks of our modern society. The air mode of transportation has been using radars, wireless telecommunications and a distributed communications/computer decision support system to control and separate aircraft since the 1950¡¯s. Today, the ground mode of transportation is adopting many of these same technologies to attempt to deal with growing highway congestion. At the same time, the air mode is attempting to radically change the traditional forms of air traffic control to deal with growing congestion in the hub and spoke network that comprises our modern international air transportation system. Communications, Navigation and Surveillance (CNS) functions are migrating from totally ground-based systems to hybrid ground and satellite based systems. Central control is migrating to distributed control. Airline Air Operations Centers are taking on increased roles and responsibilities through the use of Collaborative Decision Making (CDM). Trucking Operations Centers are tracking their fleets with space-based systems.

Master of Science in Systems Engineering

This track looks at transportation operations, monitoring and control from a systems engineering perspective. It uses analytical methods, complex simulations, program management tools and case studies to give the student an awareness of how future transportation systems will evolve.

Core Courses   Students must complete:
        SYST 510   Systems Definition and Cost Modeling (3:3:0) f
        SYST 520*   Systems Design and Integration (3:3:0) s
        SYST 530   Systems Management and Evaluation (3:3:0) f, s

Project or Thesis   Student must complete a transportation project (3 credit hours) or thesis (6 credit hours) under the direction of a Systems Engineering faculty member.

Basic Methods Courses for ATS   Students must complete 2 from the following:
        SYST 573*   Decision and Risk Analysis (3:3:0) f, s
        SYST 611   Systems Methods and Modeling (3:3:0) f
        STAT 554*   Applied Statistics (3:3:0) f,s

And one of the following:
        OR 542*   Stochastic Models in Operations Research (3:3:0) f
        SYST 595   Discrete Event Systems (3:3:0) s
        STAT 544   Applied Probability (3:3:0) f,s

Elective Courses for ATS   A set of approved elective courses is given below. Basic methods courses beyond the three required methods courses may also be counted as elective courses. The 9 hour set of elective courses must constitute a well-defined concentration area with at least 6 hours that have an explicit transportation theme.

OR 541*	Deterministic Models in Operations Research (3:3:0) s
OR 635	Discrete System Simulations (3:3:0)
SYST 542	Decision Support Systems Engineering (3:3:0) f
SYST 521/OR 643	Network Analysis (3:3:0) f
SYST 563	Research Methods in Systems Engineering and IT (3:3:0) f
SYST 512	Systems Engineering for Design and Development (3:3:0) s
SYST 513	Total Systems Eng. and Enterprise Integration (3:3:0)
SYST 571	Systems Engineering Management (3:3:0) f
SYST 460/560	**Introduction to Air Traffic Control (3:3:0) su,f**
SYST 660/OR 660	**Air Transportation Systems Modeling (3:3:0) s**
SYST 621	Systems Architecture for Large-Scale Systems (3:3:0) f, s
SYST 671/OR 671	Judgment and Choice Processing and Decision Making f
TCOM 500*	Modern Telecommunications (3:3:0) f, s
TCOM584	Satellite Systems Analysis (3:2:3)
INFS 612*	Data Communications and Distributed Processing (3:3:0)
SYST 664/STAT 664	Bayesian Inference and Decision Theory (3:3:0) s
SYST 684	Sensor Data Fusion (3:3:0) f
SYST 697	Critical Information Technology Infrastructures (3:3:0)
SYST 698	Independent Study and Research (3:3:0)may be taken twice
PSYC 530	Cognitive Engineering: Cognitive Science Applied to Human Factors
CEIE 560	Public Transportation Systems (3:3:0)
CEIE 660	Urban Transportation Planning (3:3:0)
STAT 634	Case Studies in Data Analysis (3:3:0)
IT 750	Theory & Applications of Data Mining (3:3:0)
SYST 781	Data Mining and Knowledge Discovery (3:3:0)

Master of Science in Operations Research

This track looks at transportation operations, monitoring and control from an operations research perspective. It uses both analytical methods and complex simulations to give the student an awareness of how future transportation systems will evolve.

Core Courses

OR 541*	Deterministic Models in Operations Research (3:3:0)
OR 542*	Stochastic Models in Operations Research (3:3:0)
OR 635	Discrete System Simulations (3:3:0)
OR 680	Applications Seminar (Transportation Project desirable) (3:3:0)
STAT 544	Applied Probability (3:3:0) s, f

Suggested Methods Electives (12 hours) at least 3 hours of stochastic methods and 3 hours of optimization methods must be completed.

OR 645	Stochastic Processes (3:3:0)
OR 643	Network Modeling (3:3:0)
OR 647	Queuing Theory (3:3:0)
STAT 554*	Applied Statistics (3:3:0)
OR 681	Decision and Risk Analysis (3:3:0)
OR 741	Advanced Linear Programming
OR 750	Advanced Topics (i.e. Aviation Safety Analysis)

Application to Transportation Electives (6 hours)

SYST 460/560	**Introduction to Air Traffic Control (3:3:0) su,f**
SYST 660/OR 660	**Air Transportation Systems Modeling (3:3:0) s**
CEIE 560	Public Transportation Systems (3:3:0)
CEIE 660	Urban Transportation Planning (3:3:0)

Certificate in Transportation Systems Engineering (*Proposed*)

A five course sequence is being considered that would lead to a certificate in transportation systems engineering. Upon completion of this sequence, with a grade point average of at least 3.0, the student could complete the MS in Systems Engineering with the addition of five more courses. Potential students interested in this option should contact Dr. George Donohue, gdonohue@gmu.edu.

Core Courses

SYST 530	Systems Management and Evaluation (3:3:0) f, s
SYST 573*	Decision and Risk Analysis (3:3:0) f, s
SYST 611	Systems Methods and Modeling (3:3:0) f

Elective Courses (select two)

SYST 460/560	**Introduction to Air Traffic Control (3:3:0) su,f**
SYST 660/OR 660	**Air Transportation Systems Modeling (3:3:0) s**
CEIE 560	Public Transportation Systems (3:3:0)
CEIE 660	Urban Transportation Planning (3:3:0)
TCOM 500*	Modern Telecommunications (3:3:0) f, s
CEE 4674**	Airport Planning and Design
CEE 5614**	Analysis of Air Transportation Systems

* Students pursuing a Ph.D. degree need to take qualifying exams in four of these
 courses.
**Virginia Tech courses offered through the Commonwealth Graduate Education Program

Courses in Bold represent new transportation concentration area

5/19/2003