

**University of Virginia**  
**Department of Engineering Systems and Environment**  
**Systems Engineering**  
*Updated 11/02/2023*

## **PHD COURSEWORK**

Any student enrolled in the Ph.D. program prior to the Fall 2019 semester has the option of adhering to either (a) the curriculum presented below or (b) the curriculum that was effective when the student first enrolled in the Ph.D. program.

### **Mandatory Courses**

- SYS 6001 – Introduction to Systems Analysis and Design (*Foundation Course*)
- SYS 7096 – Systems Engineering Colloquium (2 semesters as SE Ph.D. student)

### **Foundations (3 courses selected from the following)**

- SYS 6003 – Optimization Models and Methods I
- SYS 6005 – Stochastic Modeling I
- SYS 6007 – Human Factors I
- SYS 6021 – Statistical Modeling I

### **Methodological Areas (4 courses from at least 2 areas)**

Students must take four courses from at least two of the methodological areas listed below. The courses in each of the areas below are only exemplars as course offerings change from year to year. Other courses in these areas may be used to fulfill methodological requirements as approved by the student's doctoral advisory committee. Additionally, certain courses are listed in multiple areas. In these cases, the student must decide which area the course satisfies for their plan of study. Each course may only satisfy one area for the student's plan of study.

#### ***Autonomy & Controls***

- ECE 6850 – Introduction to Control Systems
- MAE 6270 – Experimental Robotics
- SYS 6060 – Autonomous Mobile Robots
- SYS 6465 – Human-Robot Interaction
- SYS 6851 – Learning in Robotics

#### ***Optimization***

- CS 6161 – Design and Analysis of Algorithms
- STAT 6020 – Optimization and Monte Carlo Methods in Statistics and Machine Learning

### ***Human Factors***

- SYS 6024 – User Experience Design
- SYS 6064 – Applied Human Factors Engineering
- SYS 6581 – Behavioral Design
- SYS 6581 – Qualitative Methods for User-Centered Design
- SYS 6581 – Human Factors in Safety
- SYS 6582 – Human Error in Complex Systems

### ***Decision and Risk Analysis***

- SYS 6034 – Discrete-Event Stochastic Simulation
- SYS 6041 – Ethics in Engineering Research and Practice
- SYS 6050 – Risk Analysis

### ***Statistical Modeling & Machine Learning***

- ECE 6782 – Machine Learning in Image Analysis
- CS 6316 – Machine Learning
- CS 6762 – Signal Processing, Machine Learning and Control
- STAT 5170 – Applied Time Series
- STAT 6160 – Experimental Design
- STAT 6440 – Introduction to Bayesian Methods
- SYS 6018 – Data Mining
- SYS 6581 – AI for Social Good

### **Research Electives (3 courses)**

Courses at the 6000 and 7000 levels are chosen in consultation with the advisory committee to support the student's research program.

### **Receiving Credit for Prior Graduate Coursework**

PhD students entering the SE program with a Master's degree from another institution are bound by the coursework requirements listed in the above curriculum; however, they may use their prior graduate coursework to fulfill them. The request for credit transfer must be submitted separately and must include the following documents: a petition form, a description of course content or syllabus, and an official transcript. Regardless of transfer credit, students must take at least 6 hours of SIE graduate course offerings.