

## Prerequisites/Course Sequence for Haverford students pursuing a 4+1 in Systems Engineering with Penn

**Background:** By the end of the 5<sup>th</sup> year, students should complete the entire 10-course master's program in Penn Systems Engineering (see [www.ese.upenn.edu/current-students/masters/sys-eng.php](http://www.ese.upenn.edu/current-students/masters/sys-eng.php) for up-to-date info on the master's program). Students can take up to 3 of these 10 courses during their 4 years at Haverford, the remainder during the "+1" at Penn.

### **Undergraduate courses required for pursuing Master's in Systems Engineering:**

- Calculus I, II, III (differential, integral, multivariable calculus) – Math 105, 118, 121 at Haverford (some students will place past 105 or 118 due to high school calculus background)
- Linear Algebra – Math 215 at Haverford
- Probability – Math 218 at Haverford
- Experience with a computer programming language – for example, this could be through Haverford CS 105 (learning Python) or Math/CS 222 (learning Matlab) or prior experience from high school

### **Undergraduate courses recommended but not strictly required:**

- An introductory statistics course – for example, this could be Math 203 or Econ 203 or 204 at Haverford, or AP statistics in high school
- An introductory economics course – Econ 105 at Haverford

### **Undergraduate courses that are useful background:**

- A course on optimization – such as Math 210 at Haverford or ESE 304 at Penn – or one that includes some focus on optimization – such as Math 222 at Haverford
- A course in differential equations (beyond the material on differential equations in the calculus sequence) – such as Math 204 or 397 at Haverford

**Suggested course plan** (assumes application to Systems Engineering program in spring of junior year):

By the end of sophomore year – complete Calculus I, II, and III, and Linear Algebra.  
Take these courses every semester beginning at the level where you are placed

During sophomore or junior year – take Math 218 (Probability) – definitely offered every other year, possibly every year – take it as soon as you are eligible

By the end of junior year – take a course involving computer programming (if not already adept from prior experience) and statistics

Possible majors – math, computer science, economics (w/math-econ concentration)

**Sample Course Sequence (for students placing at Calc III level)**

Fall I: Calculus III, Economics  
Spring I: Linear Algebra

Fall II: Probability (if offered), Computer programming course  
Spring II: Differential equations or optimization

Fall III: Statistics, Probability (if not offered previous year)  
Spring III: additional useful course(s), apply to Systems Engineering

**Sample Course Sequence (for students placing at Calc II level)**

Fall I: Calculus II, Economics  
Spring I: Calculus III

Fall II: Probability (if offered), Linear Algebra  
Spring II: Differential equations or optimization

Fall III: Statistics, Probability (if not offered previous year)  
Spring III: additional useful course(s), apply to Systems Engineering