

# NETWORKED AND SOCIAL SYSTEMS ENGINEERING, BSE

The Rajendra and Neera Singh Program in Networked and Social Systems Engineering (NETS), is the world's first course of study to fully integrate the disciplines needed to design and analyze the complex networks that are reshaping our society. This program prepares students to shape the technologies that underpin Internet-based search and electronic commerce, financial networks, social networks, and even such exchanges as the power grid. Graduates of this program will be prepared to engineer networks that work for both end-users and investors. Other graduates may become the policy makers who are urgently needed to regulate these networks for the protection of commercial property and societal good.

**For more information:** <https://www.seas.upenn.edu/prospective-students/undergrad/majors/networked-social-systems-engineering/>

## Networked and Social Systems Engineering (NETS) Major Requirements

37 course units are required.

Code	Title	Course Units
<b>Engineering</b>		
CIS 1100	Introduction to Computer Programming	1
CIS 1200	Programming Languages and Techniques I	1
CIS 1210	Programming Languages and Techniques II	1
CIS 3200	Introduction to Algorithms	1
ESE 2040	Decision Models	1
or ESE 5060	Introduction to Optimization Theory	
or ESE 6050	Modern Convex Optimization	
ESE 3030	Stochastic Systems Analysis and Simulation	1
or CIS 4190	Applied Machine Learning	
or CIS 5190	Applied Machine Learning	
or ESE 5450	Data Mining: Learning from Massive Datasets	
or CIS 5200	Machine Learning	
or CIS 5450	Big Data Analytics	
ESE 3050	Foundations of Data Science	1
NETS 1120	Networked Life	1
NETS 1500	Market and Social Systems on the Internet	1
NETS 2120	Scalable and Cloud Computing	1
NETS 3120	Theory of Networks	1
NETS 4120	Algorithmic Game Theory	1
CIS 4000	Senior Project	1
or CIS 4100	CIS Senior Thesis	
or ESE 4500	Senior Design Project I - EE and SSE	
CIS 4010	Senior Project	1
or CIS 4110	CIS Senior Thesis	
or ESE 4510	Senior Design Project II - EE and SSE	
<b>Math and Natural Science</b>		
MATH 1400	Calculus, Part I	1
MATH 1410	Calculus, Part II	1
or MATH 1610	Honors Calculus	

MATH 2400	Calculus, Part III	1
or MATH 2600	Honors Calculus, Part II	
CIS 1600	Mathematical Foundations of Computer Science	1
MATH 3120	Linear Algebra	1
or MATH 3130	Computational Linear Algebra	
or MATH 3140	Advanced Linear Algebra	
CIS 2610	Discrete Probability, Stochastic Processes, and Statistical Inference	1
or ESE 3010	Engineering Probability	
or STAT 4300	Probability	
MEAM 1100 & MEAM 1470	Introduction to Mechanics and Introduction to Mechanics Lab	1.5
or PHYS 0150	Principles of Physics I: Mechanics and Wave Motion	
or PHYS 0170	Honors Physics I: Mechanics and Wave Motion	
PHYS 0151	Principles of Physics II: Electromagnetism and Radiation	1.5
or PHYS 0171	Honors Physics II: Electromagnetism and Radiation	
or ESE 1120	Engineering Electromagnetics	

### Technical Electives

Department Approval Required <sup>1</sup> 6

### General Electives <sup>2</sup>

ECON 2100	Intermediate Microeconomics	1
ECON 4100	Game Theory	1
or ECON 4101	Game Theory Honors	
or ECON 6110	Game Theory and Applications	
EAS 2030	Engineering Ethics	1
or CIS 4230	Ethical Algorithm Design	
or CIS 5230	Ethical Algorithm Design	
or LAWM 5060	ML: Technology Law	

Select 2 Social Science or Humanities courses 2

Select 2 Social Science or Humanities or Technology in Business & Society courses 2

### Free Elective

Select 1 course unit of free electives 1

**Total Course Units 37**

<sup>1</sup> At least four courses from an approved depth area required. For the remaining courses you may use (1) courses from any approved depth area, and/or (2) courses approved by the department. In general, approved courses must be advanced courses that are rigorous/quantitative and have at least one nontrivial prerequisite. See the list of depth areas and approved courses (<https://www.nets.upenn.edu/long/nets-curriculum/>).

<sup>2</sup> Must include a Writing Seminar (a list of approved Writing Seminars can be found in the SEAS Undergraduate Handbook (<https://ugrad.seas.upenn.edu/student-handbook/courses-requirements/writing-courses/>)).

## Concentrations

Students may select one of five concentrations:

- Data Science
- Economics and Networked Markets
- Networked and Cloud Services

- Technology and Society
- Theory of Networks and Dynamics

---

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2024 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.

---