

Pre-Approved Electives for Systems Engineering M.Eng.

Degree Requirements

1. All core courses must be completed
 2. At least one elective that fulfills an Applications component must be completed
 3. At least one elective that fulfills a Modeling & Analysis component must be completed
 4. No more than one elective that fulfills a Management component may be applied toward your degree
 5. No more than one seminar may be taken each semester (for a maximum of two)
 6. A minimum of 30 credit hours taken for a letter grade must be completed
 7. All courses taken during your degree must be approved by your advisor
 8. Electives not included on this list may be petitioned to be included in your your degree plan
- 9. Check the Class Roster online (classes.cornell.edu) for the most up-to-date class listings available each semester.**
- The courses cited below are based on historical offerings and are subject to change.

Core Courses

	Course Name	Credits	Semester	Group	Comments
SYSEN 5100, CEE 5240, ECE 5120, MAE 5910, ORIE 5140	Model Based Systems Engineering	3	Fall	Core	
SYSEN 5200, CEE 5252, MAE 5920, ORIE 5142	Systems Analysis Behavior and Optimization	3	Spring	Core	
CEE 5900	Project Management	4	Fall, Spring	Core	
SYSEN 5900, SYSEN 5700	Systems Engineering Project	6 to 8	Fall, Spring	Core	

Pre-Approved Electives by Department

BEE Courses	Course Name	Credits	Semester	Group	Comments
BEE 4010	Renewable Energy Systems	3	Spring	Application	
BEE 4150	Engineering Ethics and Professional Practice	3	Fall	Management	Previously BEE 5400
BEE 4350	Principles of Aquaculture	3	Spring	Application	
BEE 4500	Bioinstrumentation	3-4	Spring	Application	
BEE 4530	CAE: Applications to Biological Processes	3	Spring	Modeling & Analysis	
BEE 4600	Deterministic and Stochastic Modeling in Biological Systems	3	Fall	Modeling & Analysis	Course to be reinstated as of Spring 2019.
BEE 4710	Introduction to Groundwater	3	Spring	Application	
BEE 4740	Water and Landscape Engineering Application	3	Spring	Application	
BEE 4750	Environmental Systems Analysis	3	Fall	Modeling & Analysis	
BEE 4760	Solid Waste Engineering	3	Spring	Application	
BEE 4800	Our Changing Atmosphere: Global Change and Atmospheric Chemistry	3	Spring	Application	
BEE 4870	Sustainable Bioenergy Systems	3	Fall	Application	Offered alternate years
BEE 4890	Entrepreneurial Management for Engineers	3	Fall	Management	
BEE 5330	Engineering Professionalism	1	Spring	Management	
BEE 6550	Biologically Inspired Microsystems Engineering	2-3	Fall	Application	Next Offered: 2019-2020
BEE 6740	Ecohydrology	3	Spring	Application	
BEE 6880	Applied Modeling and Simulation for Renewable Energy Systems	3	Spring	Modeling & Analysis	

CEE Courses	Course Name	Credits	Semester	Group	Comments
CEE 5930	Engineering Management Methods	4	Fall	Management	
CEE 5950	Construction Planning and Operations	3	Fall	Management	
CEE 5980	Introduction to Decision Analysis	3	Fall	Management	
CEE 6200	Water Resource Systems Engineering	3	Spring	Application	
CEE 6210	Stochastic Hydrology	3	Spring	Application	Offered on demand
CEE 6620	Analysis and Control of Transportation Systems and Networks	3	Spring	Modeling & Analysis	
CEE 6640	Microeconometrics of Discrete Choice	3	Fall	Modeling & Analysis	
CEE 6750	Concrete Materials and Construction	3	Spring	Application	
CEE 6790	Time Series Data Analysis for Civil, Mechanical & Geophysical Applications	3	Fall	Modeling & Analysis	
CEE 6970	Risk Analysis and Management	3	Spring	Application	

ChemE Courses	Course Name	Credits	Semester	Group	Comments
CHEM 4700	Process Control Strategies	3	Spring	Application	

CHEME 5720	Managing Business Development Solutions	3	Fall	Management	
CHEME 6610	Air Pollution Control	3	Spring	Application	
CHEME 6640	Energy Economics	3	Fall	Modeling & Analysis	
CHEME 6660	Analysis of Sustainable Energy Systems	2-3	Fall	Modeling & Analysis	
CHEME 6800, SYSEN 6800	Computational Optimization	4	Fall	Modeling & Analysis	
CHEME 6880, SYSEN 6880	Industrial Big Data Analytics and Machine Learning	3	Spring	Application or Modeling & Analysis	

CS Courses	Course Name	Credits	Semester	Group	Comments
CS 4220, MATH 4260	Numerical Analysis : Linear and Non-linear Problems	4	Spring	Modeling & Analysis	
CS 4420, ECE 4750	Computer Architecture	4	Fall	Application	
CS 4744	Computational Linguistics	4	Spring	Application	
CS 4758, ECE 4758, MAE 4758	Robot Learning	4	Spring	Application	
CS 4820	Introduction to Analysis of Algorithms	4	Spring	Modeling & Analysis	
CS 5150	Software Engineering	4	Spring	Application	
CS 5152	Open-Source Software Engineering	4	Spring	Application	
CS 5300, INFO 5300	The Architecture of Large-Scale Information Systems	4	Spring	Application	
CS 5320, CS 4320	Introduction to Database Systems	3	Fall	Application	
CS 5412	Cloud Computing	4	Spring	Application	
CS 5413	High Performance Systems and Networking	4	Spring	Application	
CS 5420, ECE 5750	Advanced Computer Architecture	4	Fall	Application	
CS 5430	System Security	4	Spring	Application	
CS 5434	Defending Computer Networks	4	Fall, Spring	Application	
CS 5450	Computer Networking	3-4	Fall, Spring	Application	
CS 5670, CS 4670	Introduction to Computer Vision	4	Spring	Application	
CS 5752	Robotic Manipulation	4	Spring	Application	
CS 5780, CS 4780	Machine Learning for Intelligent Systems	4	Spring	Application	
CS 5830	Cryptography	4	Spring	Application	
CS 5846, ECON 3810, ECON 6760	Decision Theory I	4	Spring	Modeling & Analysis	

ECE Courses	Course Name	Credits	Semester	Group	Comments
ECE 4130, MAE 4580, AEP 4130, CHEME 4130, NSE 4130	Introduction to Nuclear Science and Engineering	3	Fall	Application	Next offered: 2019-2020
ECE 4271	Evolutionary Processes, Evolutionary Algorithms, Evolutionary Games	3	Spring	Application	
ECE 4450	Computer Networks and Telecom	4	Spring	Application	
ECE 4750	Computer Architecture	4	Fall	Application	
ECE 4758, CS 4758, MAE 4750	Robot Learning	4	Spring	Application	
ECE 4760	Digital Systems Design Using Microcontrollers	4	Fall	Application	
ECE 4800	Optimal Systems Analysis and Design	4	Fall	Application	
ECE 5210	Theory of Linear Systems	3	Spring	Modeling & Analysis	
ECE 5220	Nonlinear Systems	4	Spring	Modeling & Analysis	Not offered every year
ECE 5370	Computer Vision	4	Spring	Application	Next offered: 2020-2021
ECE 5555	Stochastic Systems: Estimation and Control	4	Fall	Modeling & Analysis	
ECE 5750	Advanced Computer Architecture	4	Fall	Application	
ECE 5760	Advance Microcontroller Design	4	Spring	Application	
ECE 5770	Resilient Computer Systems	4	Fall	Application	
ECE 5775	High-Level Digital Design Automation	4	Fall	Application	
ECE 5830	Introduction to Technical Management	3	Fall	Management	
ECE 5870	Energy Seminar I	1	Fall	Seminar	
ECE 5880	Energy Seminar II	1	Spring	Seminar	

MAE Courses	Course Name	Credits	Semester	Group	Comments
MAE 4020, MAE 4021, MAE 5020	Wind Power	3	Fall	Application	
MAE 4060	Introduction to Spaceflight Mechanics	3	Fall	Application	
MAE 4120, MAE 4121, EAS 4120	Community Wind Energy Research	3	Spring	Application	
MAE 4130, MAE 4131	Mechanics of Composite Structures	3	Fall	Application	
MAE 4160, MAE 5160	Spacecraft Technology and Systems Architecture	3-4	Spring	Application	
MAE 4230, MAE 4231, MAE 5230	Intermediate Fluid Dynamics	4	Spring	Application	
MAE 4320	Micro & Nano Sensors & Systems: Bridging the Physical & Digital Worlds	4	Spring	Application	
MAE 4340, MAE 4341, MAE 5340	Innovative Product Design via Digital Manufacturing	3-4	Fall	Application	
MAE 4510, MAE 5510	Aerospace Propulsion	3	Spring	Application	
MAE 4560, MAE 5560	Bioastronautics and Human Performance	3	Spring	Application	
MAE 4580	Introduction to Nuclear Science and Engineering	3	Fall	Application	Next offered: 2019-2020
MAE 4590, AEP 4840, ECE 4840, NSE 4840	Introduction to Controlled Fusion: Principles and Technology	3	Spring	Application	
MAE 4610, EngrG 4610, ORIE 4152	Entrepreneurship For Engineers	3	Spring	Management	
MAE 4640, MAE 4641, MAE 5640, BME 4640	Orthopedic Tissue Mechanics	3 to 4	Spring	Application	
MAE 4650, MAE 4651, MAE 5650	Biofluid Mechanics	3 to 4	Spring	Application	
MAE 4660	Biomedical Engineering Analysis of Metabolic and Structural Systems	3	Fall	Application	

MAE 4700, MAE 4701, MAE 5700	Finite Element Analysis for Mechanical and Aerospace Design	4	Fall	Modeling & Analysis	
MAE 4730, MAE 5730	Intermediate Dynamics and Vibrations	3	Fall	Modeling & Analysis	
MAE 4780, MAE 5780	Feedback Control Systems	4	Fall	Modeling & Analysis	
MAE 4860, MAE 4861, MAE 5860	Automotive Engineering	3 to 4	Spring	Application	
MAE 5010	Future Energy Systems	3	Spring	Application	
MAE 5070	Dynamics of Flight Vehicles	3	Spring	Application	
MAE 5130, MSE 5120	Mechanical Properties of Thin Films	3	Spring	Application	
MAE 5180	Autonomous Mobile Robots	4	Spring	Application	
MAE 5430	Combustion Processes	3	Spring	Application	
MAE 5459	Energy Seminar I	1	Fall	Seminar	
MAE 5469	Energy Seminar II	1	Spring	Seminar	
MAE 5790	Non-Linear Dynamics and Chaos	4	Spring	Modeling & Analysis	
MAE 5949	Enterprise Engineering Colloquium	1	Spring	Seminar	
MAE 6140	State Variable Modeling	4	Fall	Modeling & Analysis	
MAE 6160, CEE 6760, MSE 6550	Advanced Composite Materials	4	Spring	Application	
MAE 6230	Computational Fluid Dynamics	4	Spring	Modeling & Analysis	
MAE 6240	Physics of Micro and Nanoscale Fluid Mechanics	4	Fall	Application	Next offered: 2019-2020
MAE 6310	Turbulence and Turbulent Flows	4	Spring	Modeling & Analysis	
MAE 6480	Air Quality and Atmospheric Chemistry	3	Fall	Application	
MAE 6510	Advanced Heat Transfer	4	Fall	Application	
MAE 6620	Biomedical Technologies for Point-of-Care Diagnostics & Global Health	3	Spring	Application	
MAE 6650, BME 6650, MSE 6650	Principles of Tissue Engineering	3	Spring	Application	Offered alternate years
MAE 6680	Cancer for Engineers and Physicists	3	Spring	Application	
MAE 6700	Advanced Dynamics	3	Spring	Modeling & Analysis	
MAE 6730	Introduction to Robotic Mobile Manipulation	4	Spring	Application	
MAE 6780	Multivariable Control Theory	4	Spring	Modeling & Analysis	
MAE 6790	Intelligent Sensor Planning and Control	3	Fall	Application	
MAE 6810	Methods of Applied Mathematics I	3	Fall	Application	
MAE 6820	Methods of Applied Mathematics II	3	Spring	Modeling & Analysis	Next offered: 2019-2020

ORIE Courses	Course Name	Credits	Semester	Group	Comments
ORIE 4154	Revenue Optimization and Marketplace Design	3	Spring	Application	
ORIE 4360	A Mathematical Examination of Fair Representation	3	Fall	Application	
ORIE 4630	Operation Research Tools for Financial Engineering	3	Fall	Application	Next offered: 2019-2020
ORIE 4820	Spreadsheet-Based Modeling and Data Analysis	3	Spring	Modeling & Analysis	
ORIE 5122	Inventory Management	3	Fall	Application	Next offered: 2020-2021
ORIE 5126	Principles of Supply Chain Management	3	Spring	Application	
ORIE 5130	Service System Modeling and Design	3	Spring	Application	
ORIE 5150, ORIE 4150	Economic Analysis of Engineering Systems	4	Spring	Modeling & Analysis	
ORIE 5260	Machine Learning for Finance	4	Spring	Application	
ORIE 5270	Big Data Technologies	4	Spring	Application	
ORIE 5280	Financial Data Practicum	3	Spring	Application	
ORIE 5310	Optimization II	4	Spring	Modeling & Analysis	
ORIE 5370	Optimization Modeling in Finance	3	Spring	Application	
ORIE 5380	Optimization Methods	3	Spring	Modeling & Analysis	
ORIE 5510, ORIE 3510	Introduction to Engineering Stochastic Processes I	4	Spring	Modeling & Analysis	
ORIE 5582	Monte Carlo Methods in Financial Engineering	2	Spring wks 8-14	Application	
ORIE 5650	Quantitative Methods of Financial Risk Management	3	Spring	Modeling & Analysis	
ORIE 6180	The Design of Online Marketplaces	3	Spring	Modeling & Analysis	Next offered: 2020-2021
ORIE 6350	Foundations of Game Theory and Mechanism Design	3	Spring	Modeling & Analysis	
ORIE 6580	Simulation	4	Spring	Modeling & Analysis	Next offered: 2019-2020
SYSEN 5500	SysML	3	Spring	Application or Modeling & Analysis	
SYSEN 5740	Design Thinking for Complex Systems	2	Spring	Application	
SYSEN 6800	Computational Optimization	4	Fall	Application or Modeling & Analysis	

SYSEN Courses	Course Name	Credits	Semester	Group	Comments
SYSEN 6100	Systems Seminar Series	1	Fall, Spring	Seminar	
ORIE 5581, ORIE 5580, ORIE 4580	Monte Carlo Simulation	2	Fall wks 1-7	Modeling & Analysis	
ORIE 4152, ENGRG 4610, MAE 4610	Entrepreneurship For Engineers	3	Spring	Management	
ORIE 4300	Optimization Modeling	3	Spring	Modeling & Analysis	Next offered: 2020-2021
ORIE 4330	Discrete Models	4	Fall	Modeling & Analysis	
ORIE 4350	Introduction To Game Theory	4	Spring	Modeling & Analysis	
ORIE 4520	Introduction to Engineering Stochastic Processes II	4	Fall	Modeling & Analysis	Next offered: 2019-2020
ORIE 4580	Simulation Modeling and Analysis	4	Fall	Modeling & Analysis	
ORIE 4600	Introduction to Financial Engineering	3	Fall	Application	Next offered: 2019-2020
ORIE 4740	Statistical Data Mining	4	Fall	Modeling & Analysis	
ORIE 4741	Learning with Big Messy Data	4	Fall	Modeling & Analysis	Next offered: 2019-2020
ORIE 5100	Design of Manufacturing Systems	4	Fall	Application	
ORIE 5230	Quantitative Trading Strategies	3	Fall	Application	
ORIE 5240	Bond Mathematics and Mortgage-Back Securities	3	Fall	Application	
ORIE 5300	Operations Research I: Optimization I	4	Fall	Modeling & Analysis	
ORIE 5500	Engineering Probability and Statistics II	4	Fall	Modeling & Analysis	

ORIE 5520, ORIE 4520	Introduction to Engineering Stochastic Processes II	4	Fall	Modeling & Analysis	Next offered: 2019-2020
ORIE 5530	Modeling Under Uncertainty	3	Fall	Modeling & Analysis	
ORIE 5550	Applied Time-Series Analysis	4	Spring	Modeling & Analysis	
ORIE 5580	Simulation Modeling and Analysis	4	Fall	Modeling & Analysis	
ORIE 6330	Graph Theory and Network Flows	3	Fall	Modeling & Analysis	Next offered: 2020-2021
ORIE 6500	Applied Stochastic Processes	4	Fall	Modeling & Analysis	
SYSEN 4200	Inventory, Operations, and Supply Chain Management: Models and Optimization	2	Fall	Modeling & Analysis	
SYSEN 5220, SYSEN 6220	Systems Dynamics	3	Fall	Application	
SYSEN 5300, SYSEN 6300, MAE 5930	Systems Engineering and Six Sigma for the Design and Operation of Reliable Systems	3-4	Fall	Application or Modeling & Analysis	
SYSEN 5400, MAE 5950, SYSEN 6400	Theory and Practice of Systems Architecture	3	Spring	Application or Modeling & Analysis	
SYSEN 5500	SysML	3	Spring	Application or Modeling & Analysis	
SYSEN 6800	Computational Optimization	4	Fall	Application or Modeling & Analysis	
SYSEN 6880	Industrial Big Data Analytics and Machine Learning	3	Spring	Application or Modeling & Analysis	
SYSEN 5240	Search and Optimization with Metaheuristics	3	Summers	Modeling & Analysis	

Other Courses	Course Name	Credits	Semester	Group	Comments
ASTRO 4431	Introduction to Astrophysics and Space Sciences I	4	Fall	Application	
ASTRO 4432	Introduction to Astrophysics and Space Sciences II	4	Spring	Application	
ASTRO 4433	Introduction to Cosmology	4	Spring	Application	Next offered: 2019-2020
ASTRO 4445, PHYS 4445	Introduction to General Relativity	4	Fall	Application	
ASTRO 6509, PHYS 6553	General Relativity	4	Fall	Application	
ASTRO 6511	Physics of Black Holes, White Dwarfs and Neutron Stars	4	Spring	Application	
ASTRO 6516	Galactic Structure and Stellar Dynamics	4	Spring	Application	
ASTRO 6560	Theory of Stellar Structure and Evolution	4	Spring	Application	
ASTRO 6578	Planet Formation and Evolution	4	Spring	Application	
ASTRO 7690	Computational Physics	3	Spring	Application	
NBA 5070	Entrepreneurship For Scientists & Engineers	3	Fall, Spring	Management	
NBA 5150	Leadership Theory and Practice	3	Fall, Spring	Management	
NBA 5380	The Business Idea Factory	1.5	Fall	Management	
NBA 5530	Accounting and Financial Decision Making	3	Spring	Management	
NBA 5640	Entrepreneurship and Business Ownership	3	Fall	Management	
NBA 6390	Data-Driven Marketing	1.5	Fall	Management	
NBA 6630	Managerial Decision Making	3	Fall	Management	
NBA 6650	Managing Technology and Innovation	3	Spring	Management	
NBA 6910	Physical Product Entrepreneurship	1.5	Spring	Management	
HADM 7110	Organizational Behavior	3	Fall	Management	
ILROB 4230	Leadership in Organizations	4	Fall, Spring	Management	Next offered: 2019-2020
ILROB 5200	Organizational Behavior and Analysis	3	Fall, Spring	Management	
INFO 6220, CS 4852, ECON 3825, INFO 4220	Networks II: Market Design	3	Spring	Modeling & Analysis	
INFO 4400, COMM 4400	Advanced Human Computer Interactive Design	3	Spring	Application	
NCC 5500	Financial Accounting	3	Spring	Management	
NCC 5560	Managerial Finance	3	Fall, Spring	Management	
NCC 5580	Managing Operations	3	Fall, Spring	Management	
NCC 5090	Strategy	2.5	Summer, Fall	Management	