

Doctoral Program in Computational Science and Engineering

Approved Computational Science and Engineering Subject List

SUBJECT #	SUBJECT NAME	TERM (F / S)	NOTES
1.125	Architecting & Engineering Software Systems	F	
1.545	Atomistic Modeling & Simulations of Materials & Structures	F	
1.583	Topology Optimization of Structures	F	
1.723	Computational Methods for Flow in Porous Media	S	
2.096[J] / 6.7300[J] / 16.910[J]	Introduction to Numerical Simulation	F	Formerly 6.336[J]
2.097[J] / 6.7330[J] / 16.920[J]	Numerical Methods for Partial Differential Equations	F	Formerly 6.339[J]
2.098	Introduction to Finite Element Methods for Partial Differential Equations	S	
2.111[J] / 6.6410[J] / 8.370[J] / 18.435[J]	Quantum Computation	F	
2.168	Learning Machines	S	
2.29	Numerical Fluid Mechanics	S	
3.320	Atomistic Computer Modeling of Materials	S	
4.450[J] / 1.575[J]	Computational Structural Design and Optimization	F	
6.3732[J] / IDS.131[J]	Statistics, Computation and Applications	S	Formerly 6.439[J]
6.7200[J] / 15.093[J] / IDS.200[J]	Optimization Methods	F	Formerly 6.255[J]
6.7210[J] / 15.081[J]	Introduction to Mathematical Programming	F	Formerly 6.251[J]
6.7220[J] / 15.084[J]	Nonlinear Optimization	S	Formerly 6.252[J]
6.7230	Algebraic Techniques and Semidefinite Optimization	S	Formerly 6.256
6.7250	Optimization for Machine Learning	S	Taught as 6.881 in Spring '21
6.7310[J] / 18.335[J]	Introduction to Numerical Methods	S	Formerly 6.337[J]
6.7720[J] / 15.070[J]	Discrete Probability and Stochastic Processes	S	Formerly 6.265[J], Advanced Stochastic Processes
6.7810	Algorithms for Inference	F	Formerly 6.438
6.7830	Bayesian Modeling and Inference	S	Formerly 6.435
6.7900	Machine Learning	F	Formerly 6.867
6.7910[J] / 9.520[J]	Statistical Learning Theory and Applications	F	Formerly 6.860[J]
6.7940	Dynamic Programming and Reinforcement Learning	S	Formerly 6.231, Dynamic Programming and Stochastic Control
6.8300	Advances in Computer Vision	S	Formerly 6.869

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6.8410	Shape Analysis	S	Formerly 6.838
6.C51	Modeling with Machine Learning: from Algorithms to Applications	S	6 units; Students cannot receive credit without simultaneous completion of 6-unit disciplinary module; Formerly 6.482
9.660	Computational Cognitive Science	F	
10.551	Systems Engineering	S	
10.552	Modern Control Design	F	
10.554[J] / 2.884[J]	Process Data Analytics and Machine Learning	F	
10.557	Mixed-integer and Nonconvex Optimization	S	
10.637[J] / 5.698[J]	Computational Chemistry	F	Formerly Quantum Chemical Simulation
12.515	Data and Models	S	
12.521	Computational Geophysical Modeling	F	
12.620[J] / 6.5160[J] / 8.351[J]	Classical Mechanics: A Computational Approach	F	Formerly 6.946[J]
12.714	Computational Data Analysis	S	
12.805	Data Analysis in Physical Oceanography	F	
12.850	Computational Ocean Modeling	S	
15.077[J] / IDS.147[J]	Statistical Machine Learning and Data Science	S	Cannot be used if taken Fall 2015 or after & credit also received for 6.867/6.7900
15.083	Integer Programming and Combinatorial Optimization	S	Sloan bidding process required
15.764[J] / 1.271[J] / IDS.155[J]	Theory of Operations Management	S	
16.110	Flight Vehicle Aerodynamics	F	
16.225[J] / 2.099[J]	Computational Mechanics of Materials	S	
16.413	Principles of Autonomy and Decision Making	F	
16.888[J] / IDS.338[J]	Multidisciplinary System Design Optimization	S	
16.930	Advanced Topics in Numerical Methods for Partial Differential Equations	S	
16.940	Numerical Methods for Stochastic Modeling & Inference	F	
18.336[J] / 6.7340[J]	Fast Methods for Partial Differential and Integral Equations	F	Formerly 6.335[J]

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18.337[J] / 6.7320[J]	Parallel Computing and Scientific Machine Learning	S	Formerly 6.338[J]
18.338	Eigenvalues of Random Matrices	F	
18.369	Mathematical Methods in Nanophotonics	S	
22.15	Essential Numerical Methods	S	First half of term
22.212	Nuclear Reactor Analysis II	S	
22.213	Nuclear Reactor Physics III	F	
22.315	Applied Computational Fluid Dynamics and Heat Transfer	S	

Previously Approved Subjects No Longer Included

- 1.124[J] / 2.091[J] Software and Computation for Simulation [No longer offered]
- 1.204 Computer Modeling: From Human Mobility to Transportation Networks [No longer offered]
- 2.089[J] / 1.128[J] Computational Geometry [No longer offered]
- 2.093 Finite Element Analysis of Solids and Fluids I [No longer offered]
- 2.094 Finite Element Analysis of Solids and Fluids II [No longer offered]
- 2.37 Fundamentals of Nanoengineering [Cannot be used if taken Spring 2020 or later]
- 6.864 Advanced Natural Language Processing
- 6.581[J] / 20.482[J] Foundations of Algorithms and Computational Techniques in Systems Biology [No longer offered]
- 6.673 Intro to Numerical Simulation in Electrical Engineering [No longer offered]
- 10.34 Numerical Methods Applied to Chemical Engineering [CSE credit for Course 10 students only, Fall 2019 forward]
- 15.062[J] / IDS.145[J] Data Mining [Cannot be used if taken Fall 2019 forward]
- 15.074[J] / IDS.213[J] Predictive Data Analytics and Statistical Modeling [No longer offered]
- 15.082 Network Optimization [No longer offered]
- 18.0851 Computational Science and Engineering I [Cannot be used if taken Fall 2017 or later]
- 18.0861 Computational Science and Engineering II [Cannot be used if taken Fall 2017 or later]
- 22.107 Computational Nuclear Science and Engineering [No longer offered]