

Area A -- Approved Course List

(For doctoral students - at least 6 credit hours of Area A course work must be earned in courses listed or cross-listed with the Math department.)

| Course Title | Course # | Last offered |
|--|--|--------------|
| Advanced Theory of Finite Element Methods | CSE 393H, E M 394H | Spring 2023 |
| Advanced Topics in Estimation Theory | ASE 381P.7 | Fall 2023 |
| Algebraic Geometry | M 392C* | Fall 2024 |
| Algebraic Topology | M 382C | Fall 2024 |
| Analytical Methods I | ASE 380P.1, E M 386K | Fall 2024 |
| Analytical Methods II | ASE 380P.2, E M 386L, CSE 386L | Spring 2023 |
| Applied Probability | ORI 390R.1 | Fall 2024 |
| Bayesian Deep Learning† | STA 380 | Fall 2019 |
| Bayesian Statistical Methods† | SDS 384.7 | Spring 2024 |
| Combinatorics and Graph Theory | C S 388C | Fall 2024 |
| Comp PDE-Constrnd Bayesian Inv | CSE 397*, E M 397* | Fall 2016 |
| Complex Analysis | CSE 385S, M 381D | Spring 2024 |
| Computational & Variational Methods for Inverse Problems | CSE 393P, M E 397*, GEO 391*, ORI 397* | Spring 2024 |
| Convex Optimization | ECE 381K.18 | Fall 2024 |
| Deep Learning I | M 393C* | Fall 2022 |
| Deep Learning II | M 393C* | Spring 2023 |
| Design & Analysis of Experiments | CSE 384U, M 384E, SDS 384.6 | Spring 2024 |
| Differential Geometry | M 392C* | Fall 2021 |
| Differential Topology | M 382D | Spring 2024 |
| Fast Algorithms: Theory & Practice | CSE 393*, M 397C* | Spring 2022 |
| Foundational Techniques Machine Learning/Data Science | CSE 382M, M 393C*, C S 395T* | Spring 2024 |
| Functional Analysis in Theoretical Mechanics | CSE 386M, E M 386M | Fall 2024 |
| Geometric Foundations of Data Science | CSE 392* | Fall 2023 |
| Geometric Methods in Data Science | CSE 392*, M 392C* | Fall 2021 |
| Graphical Models | C S 395T* | Fall 2015 |
| Introduction Theo/Cmpt Mth Mach Learn | CSE 392* | Fall 2020 |
| Introduction to Applied Harmonic Analysis | CSE 396*, M 393C* | Fall 2016 |
| Large Scale Optimization II | ECE 381V* | Spring 2024 |
| Linear Models | SDS 387 | Fall 2024 |
| Markov Chains & Mixing Time | M 393C* | Spring 2020 |
| Math Statistics for Applics | STA 380.10* | Fall 2023 |
| Mathematical Methods for Statistical Analysis† | SDS 381 | Spring 2020 |
| Mathematical Methods in Science & Engineering | CSE 386L, E M 386L, ASE 380P.2 | Spring 2024 |
| Mathematical Statistics I | CSE 384R, M 384C, SDS 384.2 | Fall 2024 |
| Mathematical Statistics II | CSE 384S, M 384D, SDS 384.3 | Spring 2024 |
| Mathematics in Deep Learning | M 393C* | Fall 2024 |
| Methods of Applied Mathematics I | CSE 386C, M 383C | Fall 2024 |
| Methods of Applied Mathematics II | CSE 386D, M 383D | Spring 2024 |
| Methods of Mathematical Physics I | CSE 385M, PHY 381M | Fall 2024 |
| Monte Carlo Methods in Statistics† | SDS 386D | Spring 2024 |

* Indicates topics course number. Topic title must match.

† Indicates course may be counted as listed/cross-listed with Math dept

Area A -- Approved Course List

(For doctoral students - at least 6 credit hours of Area A course work must be earned in courses listed or cross-listed with the Math department.)

| Course Title | Course # | Last offered |
|--|------------------------------|--------------|
| Multiscale Modeling & Computation | CSE 396*, M 393C* | Spring 2015 |
| Nonlinear Optimization | ORI 397* | Fall 2021 |
| Nonlinear Programming | ORI 391Q.1 | Spring 2024 |
| Optimal Control Theory | ASE 381P.3 | Spring 2024 |
| Partial Differential Equations I | CSE 396.1, M 393C* | Fall 2024 |
| Partial Differential Equations II | CSE 396*, M 393C* | Spring 2024 |
| Predictive Machine Learning | CSE 392*, M 393C*, C S 395T* | Fall 2023 |
| Probability & Stochastic Processes I | ECE 381J | Fall 2024 |
| Randomized Algorithms | C S 388R | Fall 2023 |
| Real Analysis | CSE 385R, M 381C | Fall 2024 |
| Regression Analysis | CSE 384T, M 384G, SDS 384.4 | Fall 2024 |
| Statistical Estimation Theory | ASE 381P.6 | Fall 2024 |
| Statistical Methods I† | SDS 380C | Fall 2024 |
| Statistical Methods II† | SDS 380D | Spring 2024 |
| Statistical Modeling I† | SDS 383C | Fall 2024 |
| Statistical Modeling II† | SDS 383D | Spring 2024 |
| Statistical Models for Big Data† | SDS 385* | Fall 2022 |
| Stochastic Processes I | CSE 394.1, M 394C* | Fall 2024 |
| Theoretical Statistics† | SDS 384.11 | Spring 2024 |
| Theory of Probability I | CSE 384K, M 385C | Fall 2024 |
| Theory of Probability II | CSE 384L, M 385D | Spring 2024 |
| Understanding Inversion & Machine Learning | CSE 397, E M 397 | Fall 2018 |

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Area B -- Approved Course List

| Course name | Course # | Last offered |
|--|--|--------------|
| Advanced Numerical Methods - Theory & Practice | ME 397* | Spring 2022 |
| Advanced Theory of Finite Element Methods | CSE 393H, E M 394H | Spring 2023 |
| Autonomous Robots | CS 393R | Spring 2024 |
| Bayesian Methods: Machine Learning | STA 380* | Spring 2018 |
| Bayesian Statistical Methods | SDS 384.7 | Spring 2024 |
| Bootstrap Statistics | NEU 384C | Spring 2020 |
| Boundary Element Methods | CE 380P.4 | Fall 2024 |
| Comp PDE-Constrnd Bayesian Inv | CSE 397*, E M 397* | Fall 2018 |
| Comp Stat Appl in Data Sci | CS 395T* | Spring 2020 |
| Compilers | CS 380C | Spring 2024 |
| Computational & Variational Methods for Inverse Problems | CSE 393P, M E 397*, GEO 391*, ORI 397* | Spring 2024 |
| Computational Methods in Radiation Transport | CSE 397*, ME 388F | Fall 2020 |
| Computer Graphics | CSE 382G, CS 384G | Spring 2022 |
| Convex Optimization | ECE 381K.18 | Fall 2024 |
| Convex Optimization Theory | ECE 381V* | Fall 2015 |
| Data Mining | ECE 380L.10 | Fall 2021 |
| Data Mining: A Mathematical Perspective | CS 391D | Spring 2020 |
| Data-Driven Algorithm Design | CS 388D | Fall 2023 |
| Fast Algorithms: Theory & Practice | CSE 393*, M 397C* | Spring 2022 |
| Fast Methods in Scientific Computing | M 393C* | Spring 2019 |
| Finite Element Method in Geophysics | GEO 384F | Fall 2022 |
| Finite Element Methods | CSE 393F, E M 394F, ASE 384P.4 | Fall 2023 |
| Foundational Techniques Machine Learning/Data Science | CSE 382M | Spring 2024 |
| Foundations of Computational Fluid Dynamics | ASE 382Q.11 | Fall 2023 |
| Geometric Foundations of Data Science | CSE 392* | Fall 2023 |
| Geometric Methods in Data Science | CSE 392*, M392C* | Fall 2021 |
| Geophysical Time Series Analysis | GEO 384R | Spring 2016 |
| Introduction Theo/Cmpt Mth Mach Learn | CSE 392* | Fall 2020 |
| Introduction to Applied Harmonic Analysis | M 393C* | Fall 2016 |
| Large Scale Optimization II | ECE 381V* | Spring 2024 |
| Learning for Dynamics and Control | ASE 389* | Fall 2023 |
| Learning-Based Optimal Control | ECE 381V* | Fall 2024 |
| Linear Programming | ORI 391Q.5 | Fall 2024 |
| Machine Learning | CS 391L | Spring 2023 |
| Monte Carlo Methods in Statistics | SDS 386D | Spring 2024 |
| Multicore Computing | ECE 382C.12 | Spring 2022 |
| Multiscale Methods in Computational Fluid Dynamics | CSE 397.1 | Spring 2024 |
| Multiscale Modeling & Computation | M 393C* | Fall 2017 |
| Neural Computation | CS 395T* | Spring 2021 |
| Neural Networks | NEU 394N, NEU 394P*, CS 394N | Fall 2024 |
| Nonlin Stat/Dyn Fin Elem Anly | CSE 397.2 | Fall 2024 |
| Nonlinear Optimization | ORI 397* | Fall 2021 |
| Nonlinear Programming | ORI 391Q.1 | Spring 2024 |
| Numerical Analysis: Differential Equations | CSE 383L, M 387D | Spring 2024 |
| Numerical Analysis: Algebra & Approximation | CSE 383K, M 387C | Fall 2024 |
| Numerical Analysis: Linear Algebra | CSE 383C, CS 383C, M 383E | Fall 2024 |

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Area B -- Approved Course List

| Course name | Course # | Last offered |
|---|------------------------------|--------------|
| Numerical Optimization: Graphics/AI | C S 395T* | Spring 2024 |
| Optimization Under Uncertainty | ORI 391Q.17 | Spring 2023 |
| Optimization: Theory & Practice | CHE 385P, CHE 384T | Spring 2024 |
| Parallel Algorithms | C S 388P | Fall 2016 |
| Parallel Algorithms for Scientific Computing | CSE 392.1, C S 395T* | Spring 2024 |
| Parallel Computing for Science & Engineering | SDS 394C | Spring 2023 |
| Predictive Computational Science Foundations | CSE 397* | Spring 2020 |
| Predictive Machine Learning | CSE 392*, M 393C*, C S 395T* | Fall 2023 |
| Randomized Algorithms | C S 388R | Fall 2024 |
| Reinforcement Learning: Theory and Practice | C S 394R, ECE 381V* | Spring 2024 |
| Scalable Machine Learning | C S 395T* | Fall 2015 |
| Scientific & Technical Computing | SDS 394 | Fall 2023 |
| Scientific Computing in Machine & Deep Learning | CSE 392* | Fall 2024 |
| Special Topics in Machine Learning | ECE 381V* | Fall 2021 |
| Stabilized Multiscale Methods in CFD | CSE 397* | Spring 2020 |
| Statistical & Discrete Methods for Scientific Computing | CSE 383M | Spring 2020 |
| Stochastic Sys, Estimation, and Control | M E 384Q.7 | Spring 2024 |
| Sublinear Algorithms | C S 390S | Fall 2024 |
| The Finite Element Method | CSE 393.1, C E 381R | Fall 2024 |
| Tools & Techniques of Computational Science | CSE 380 | Fall 2024 |
| Understanding Inversion & Machine Learning | CSE 397*, E M 397* | Fall 2018 |
| Validation & Uncertainty Quantification in Computational Models | CSE 397.3 | Fall 2024 |
| Verif & Synthesis for Cyberphys Sys | C S 395T*, ASE 396* | Fall 2024 |

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Area C -- Approved Course List

| Course name | Course # | Last offered |
|--|---------------------------------------|--------------|
| 3D Remote Sensing Analytics/App | ASE 389* | Fall 2021 |
| Acoustics I | ME 384N.1 | Fall 2024 |
| Acoustics II | ME 384N.2 | Spring 2024 |
| Advanced Combustion | ME 382R.5 | Spring 2022 |
| Advanced Dynamics | EM 381 | Spring 2024 |
| Advanced Numerical Methods - Theory & Practice | ME 397* | Spring 2022 |
| Advanced Petrophysics | PGE 381L | Fall 2024 |
| Advanced Physical Chemistry | CH 382M | Spring 2024 |
| Advanced Physical Chemistry: Intro to Quantum Mechanics | CH 382K | Fall 2024 |
| Advanced Physical Chemistry: Statistical Mechanics | CH 382L | Fall 2024 |
| Advanced Problems in Compressible Flow | ASE 382Q.7 | Fall 2024 |
| Advanced Reservoir Engineering | PGE 388 | Fall 2024 |
| Advanced Thermodynamics | CHE 387K | Fall 2024 |
| Advanced Thermodynamics & Phase Behavior | PGE 384 | Spring 2023 |
| Applied Orbital Mechanics† | ASE 366L | Spring 2023 |
| Applied Reservoir Characterization | PGE 383.58 | Spring 2015 |
| Applied Stochastic Processes | ORI 390R.5 | Spring 2024 |
| Astrophysical Gas Dynamics | AST 382C, PHY 396T* | Fall 2024 |
| Autonomous Robots | CS 393R | Spring 2024 |
| Biodesign: Innov/Design I | BME 385J* | Spring 2022 |
| Biodesign: Needs Identification | BME 385J* | Fall 2021 |
| Bioinformatics | BCH 394P | Spring 2024 |
| Biomechanics of Tissues, Scaffolds, and Cells | CSE 397.5 | Fall 2023 |
| Biomed Imaging Signals & Systems | BME 381J.3, EE 385J.18 | Fall 2024 |
| Biostatistics, Study Design, & Research Methodology | BME 380J.5 | Spring 2024 |
| Brain Computer Interaction | ECE 385V* | Fall 2020 |
| Brain Connectivity | PSY 381D* | Spring 2019 |
| Cell Biology | BIO 395H, CH 395H, MOL 395H | Spring 2022 |
| Classical Mechanics | PHY 385K | Fall 2024 |
| Climate System Modeling | GEO 387G | Fall 2024 |
| Clinical Cardiology | CSE 397* | Fall 2018 |
| Computational & Variational Methods for Inverse Problems | CSE 393P, ME 397*, GEO 391*, ORI 397* | Spring 2024 |
| Computational Bio & Bioinformatics | SDS 385* | Spring 2021 |
| Computational Electromagnetics | ECE 383V* | Spring 2015 |
| Computational Materials Science and Engineering | ME 397* | Spring 2023 |
| Computational Methods for Biomedical Engineers | BME 383J.9 | Fall 2023 |
| Computational Methods in Radiation Transport | CSE 397*, ME 388F | Fall 2020 |
| Computational Modeling in Bioengr & Medicine | CSE 397*, BME 385J* | Spring 2019 |
| Computational Modeling of the Cardiovascular System | CSE 397* | Fall 2020 |
| Continuum Mechanics | EM 384K | Fall 2024 |
| Convex Optimization and Engr Apps | ASE 396* | Fall 2015 |
| Density Functional Theory | PHY 392Q | Fall 2023 |
| Dynamics of Atmospheres & Oceans | GEO 387F | Spring 2020 |
| Dynamics of Turbulent Flow | ME 381P.3 | Spring 2024 |
| Electromagnetic Field Theory | ECE 383L | Fall 2023 |
| Electromagnetic Theory I | PHY 387K | Fall 2024 |

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Area C -- Approved Course List

| Course name | Course # | Last offered |
|--|-------------------------------|--------------|
| Elements of Cosmology | AST 396C | Fall 2023 |
| Environmental Fluid Mechanics | C E 380S | Spring 2024 |
| Evolution of Reef Ecosystems | GEO 389E | Fall 2024 |
| Financial Mathematics for Actuarial Applications | M 389W | Fall 2022 |
| Financial Risk Management | FIN 397.4 | Fall 2023 |
| Finite Element Method in Geophysics | GEO 384F | Fall 2022 |
| FMRI Brain Decoding | NEU 394P* | Spring 2018 |
| Foundations of Computational Fluid Dynamics | ASE 382Q.11 | Fall 2023 |
| Foundations of Fluid Mechanics | ASE 382Q.1 | Fall 2024 |
| Fracture Mechanics | EM 388F | Spring 2024 |
| Fundamentals of Biomedical Optical Imaging | BME 381J.9 | Fall 2024 |
| Fundamentals of Combustion | ME 382R.1 | Fall 2024 |
| Fundamentals of Enhanced Oil Recovery I | PGE 387K | Spring 2024 |
| Fundamentals of Incompressible Flow | ME 381P.1 | Fall 2024 |
| Genetics | BIO 395F, CH 395F, MOL 395F | Spring 2024 |
| Genomic Signal Proc & Data Science | ECE 381V* | Spring 2022 |
| Intro to Computational Oncology | CSE 397.6 | Spring 2024 |
| Intro to Mathematical Modeling in Science & Engineering I | CSE 389C | Fall 2024 |
| Intro to Mathematical Modeling in Science & Engineering II | CSE 389D | Spring 2024 |
| Introduction to System Theory | ECE 380K | Spring 2016 |
| Inverse Theory | GEO 384M | Fall 2024 |
| Linear Systems Analysis | ASE 381P.1 | Fall 2024 |
| Machine Learning | C S 391L | Spring 2023 |
| Machine Learning Applications | GEO 391* | Spring 2023 |
| Machine Learning: Large-Scale Data | ECE 381V* | Spring 2016 |
| Markov Decision Process | ORI 390R.16 | Spring 2023 |
| Mathematical Physiology | CSE 397.9 | Spring 2024 |
| Mathematics in Finance | R M 391* | Spring 2021 |
| Methods in Orbit Determination | ASE 389P.4 | Spring 2024 |
| Micromechanics | EM 388M | Fall 2021 |
| Mod Flow/Trans in Porous Media | GEO 391* | Fall 2018 |
| Modeling & Simulation Cardiac Function | CSE 397* | Spring 2017 |
| Molecular Gas Dynamics | ASE 382R.6 | Fall 2024 |
| Molecular Gas Dynamics II | ASE 382R* | Fall 2022 |
| Morphodynam/Quant Stratigraphy | GEO 391* | Fall 2018 |
| Multidimensional Data Analysis in Geosciences | GEO 384H | Fall 2022 |
| Multiscale Methods in Computational Fluid Dynamics | CSE 397.1 | Spring 2024 |
| Multiscale Nanomechanics | ME 397* | Fall 2024 |
| Natural Language Processing | C S 388 | Fall 2024 |
| Neural Computation | C S 395T* | Spring 2021 |
| Neural Dynamics & Information Theory | M 393C* | Fall 2023 |
| Neural Engineering | ECE 385J.1 | Spring 2024 |
| Neural Networks | NEU 394N, NEU 394P*, C S 394N | Fall 2024 |
| Nonlin Fin El/Isogeo Anly Mths | CSE 397* | Spring 2014 |
| Nonlin Stat/Dyn Fin Elem Anly | CSE 397.2 | Fall 2024 |
| Nonlinear Acoustics | ME 384N.4 | Spring 2023 |

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Area C -- Approved Course List

| Course name | Course # | Last offered |
|--|---------------------|--------------|
| Nuclear Reactor Theory I | ME 388D | Fall 2024 |
| Numerical Modeling in the Geosciences | GEO 398M | Spring 2024 |
| Numerical Simulation of Reservoirs | PGE 392K | Fall 2023 |
| Optimal Control Theory | ASE 381P.3 | Spring 2024 |
| Physical Climatology | GEO 387H | Fall 2023 |
| Physical Hydrology | GEO 382S | Fall 2024 |
| Physical Oceanography | GEO 382P | Spring 2023 |
| Physical Simulation of Computer Graphics | C S 384P | Spring 2024 |
| Plasma and Reactive Flows | ASE 382Q.10 | Spring 2024 |
| Plasma Physics I | PHY 380L | Spring 2024 |
| Predictive Computational Science Foundations | CSE 397* | Spring 2020 |
| Principles of Neuroscience I | NEU 382T | Fall 2024 |
| Quantum Field Theory I | PHY 396K | Fall 2024 |
| Quantum Mechanics I | PHY 389K | Fall 2024 |
| Reactive Flow in Porous Media | GEO 391* | Spring 2016 |
| Relativity Theory I | PHY 387M | Fall 2024 |
| Research in Computational Linguistics | LIN 389C | Fall 2024 |
| Robot Learning | C S 391R | Fall 2024 |
| Scalable Machine Learning | C S 395T* | Fall 2015 |
| Seismic Data Processing | GEO 384S | Spring 2024 |
| Seismology II | GEO 380F | Fall 2022 |
| Seismology III | GEO 390D | Fall 2022 |
| Semiconductor Physics | ECE 396K.2 | Spring 2024 |
| Solid Mechanics I | ASE 384P.1 | Fall 2024 |
| Solid Mechanics II | EM 388L, ASE 384P.2 | Spring 2024 |
| Solid-State Physics I | PHY 392K | Spring 2024 |
| Solid-State Physics: Biophysics | PHY 392T* | Fall 2021 |
| Spacecraft Dynamics† | ASE 366K | Fall 2024 |
| Stability/Multiscale Methods in CFD | CSE 397* | Spring 2020 |
| Statistical Mechanics | PHY 385L | Fall 2024 |
| Stochastic Hydrology | C E 385S | Fall 2024 |
| Structural Dynamics | EM 384L, ASE 384P.3 | Spring 2024 |
| Structured Models for NLP | C S 395T* | Fall 2017 |
| Systems Modeling | ORI 390Q.8 | Spring 2023 |
| Theory of Plasticity | EM 380 | Spring 2024 |
| Thermodynamics of Geologic Processes | GEO 390M | Spring 2024 |
| Transport Phenomena | PGE 381M | Fall 2024 |
| Uncertainty Quantification | ASE 389* | Spring 2024 |
| Uncertainty Quantification | GEO 391* | Spring 2015 |
| Underwater Acoustics | ME 384N.5 | Fall 2024 |
| Vision Systems | NEU 380E | Fall 2022 |
| Wave Propagation I | EM 394V | Spring 2018 |

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