Computer Science Concentration Area Courses

For students who started at RPI in the Fall 2022/Spring 2023 academic year or earlier, keep reading. Otherwise, if your first semester at RPI (regardless of initial major) is Fall 2023 or later, do **not** use this document as it does not apply to your degree requirements.

For F22/S23 and earlier, all accepted CS Option/Capstone courses are listed in the pages below.

In general, all CSCI students are required to take **three** courses in one specific area, plus a **fourth** CS Option course; this fourth course must be in a different area for all students who started at RPI in Fall 2021 or later.

In the areas below, courses shown in *italics* are no longer offered or are being phased out. Courses that meet the communication intensive requirement are marked as **[CI]**.

For any missing courses or questions, please contact **goldsd3@rpi.edu** with the course syllabus, schedule of topics, etc.

Last updated: 3/13/2024

(a) Concentration Area: Theory, Algorithms, and Mathematics (*formerly Theory and Algorithms*)	
CSCI 4020/*6020*	Design and Analysis of Algorithms
CSCI 4030/6220	Randomized Algorithms
CSCI 4040/6040	Approximation Algorithms
CSCI 4100/6100	Machine Learning from Data
CSCI 4110/6110 (or CSCI 496x/696x)	Computational Social Processes
CSCI 4120/6120	Computational Finance
CSCI 4150	Introduction to Artificial Intelligence
CSCI 4230/6230	Cryptography and Network Security I **[CI]**
CSCI 4250/6250	Frontiers of Network Science **[CI]**
CSCI 4260 (or MATH 4150)	Graph Theory
CSCI 4420 (or PHIL 4420 or MATH 4030)	Computability and Logic
CSCI 4450/6450	Principles of Program Analysis
CSCI 4510/6510	Distributed Systems and Algorithms
CSCI 4560/6560	Computational Geometry
CSCI 4800 (or MATH 4800)	Numerical Computing
CSCI 4820 (or MATH 4820)	Introduction to Numerical Methods for Diff. Eqns.
CSCI 496x	Introduction to Quantum Computing
CSCI 496x/696x	Theory of Computation
CSCI 496x	Intermediate Formal Logic and AI
CSCI 496x/696x	ML for Bioinformatics (*Computational Biology*)
CSCI 496x (or COGS 4210/6210)	Cognitive Modeling
CSCI 496x/696x	Parallel Graph Analysis
CSCI 496x/696x	Large-Scale Matrix Computation and ML
CSCI 496x/696x	Machine Learning and Optimization
CSCI 496x (or COGS 4410/6410)	Programming for Cognitive Science and AI
CSCI 496x/696x	Network Resilience
CSCI 496x/696x	Software Verification
CSCI 496x/696x	Economics and Computation
CSCI 496x	Introduction to Network Science
CSCI 496x/696x	Computing and Quantum Computing
CSCI 6800 (or MATH 6800)	Computational Linear Algebra
CSCI 6820 (or MATH 6820)	Numerical Solution of Ordinary Differential Eqns
CSCI 6840 (or MATH 6840)	Numerical Solution of Partial Differential Eqns
CSCI 6860 (or MATH 6860)	Finite Element Analysis
CSCI 496x/696x	Algorithmic Game Theory
CSCI 496x/696x	Deep Learning on Graphs
ECSE 4170/6170	Modeling & Simulation for Cyber-Physical Systems
ECSE 4850/496x	Introduction to Deep Learning
ECSE 496x	Introduction to Machine Learning
ECSE 496x/696x	Quantum Computer Programming
ECSE 496x/696x	Networks and Networked Systems
ECSE 6610	Pattern Recognition
MATH 4840	Numerical Linear Algebra with Applications
MATP 4820/6610	Computational Optimization
MATP 6640	Linear Programming

(b) Concentration Area: Systems and Software	
CSCI 4220	Network Programming
CSCI 4310/6310	Networking in the Linux Kernel **[CI]**
CSCI 4320/6360	Parallel Programming/Parallel Computing
CSCI 4380	Database Systems
CSCI 4440	Software Design and Documentation **[CI]**
CSCI 4450/6450	Principles of Program Analysis
CSCI 4460/6460	Large-Scale Programming and Testing **[CI]**
CSCI 4470 (or *CSCI 496x*)	Open Source Software
CSCI 4500/6500	Distributed Computing over the Internet
CSCI 4510/6510	Distributed Systems and Algorithms
CSCI 496x/696x	Programming in Haskell
CSCI 496x	Network Security and Defense
CSCI 496x/696x	AI and Blockchain
CSCI 496x/696x	Cloud Computing Seminar
CSCI 496x/696x (or ITWS 496x)	Modern Binary Exploitation (MBE)
CSCI 496x/696x (or ITWS 4500)	Web Science Systems Development
CSCI 496x (or ECSE 4670)	Computer Communication Networks (CCN)
CSCI 4330 (or CSCI 496x)	Application/Advanced Programming using Java **[CI]**
CSCI 496x/696x	Graph Mining
ECSE 4660	Internetworking of Things
ECSE 4740	Applied Parallel Computing for Engineers
ECSE 4770	Computer Hardware Design (CHD)
ECSE 4780	Advanced Computer Hardware Design (ACHD)
ECSE 4790	Microprocessor Systems (MPS)
ITWS 4370	Information System Security

(c) Concentration Area: Artificial Intelligence and Data	
CSCI 4100/6100	Machine Learning from Data
CSCI 4110/6110	Computational Social Processes
CSCI 4150	Introduction to Artificial Intelligence
CSCI 4270/6270	Computational Vision
CSCI 4340/6340	Ontologies
CSCI 4350/6350 (or ITWS 4350/6350)	Data Science
CSCI 4370/6370	Data and Society **[CI]**
CSCI 4380	Database Systems
CSCI 4390/6390	Data Mining
CSCI 4400/6400	Xinformatics
CSCI 4420 (or PHIL 4420 or MATH 4030)	Computability and Logic
CSCI 4480 (or ECSE 4480)	Robotics I
CSCI 4490/6490 (or ECSE 4490/6490)	Robotics II
CSCI 4600/6600 (or ITWS 4600/6600)	Data Analytics
CSCI 496x/696x	AI for Science
CSCI 496x/696x	AI for Conservation
CSCI 496x	NLP with Deep Learning
CSCI 496x/696x	Projects in Machine Learning and AI
CSCI 496x/696x	Safe Autonomy / ML for Autonomous Systems
CSCI 496x/696x	AI and Blockchain
CSCI 496x	Intermediate Formal Logic and AI
CSCI 496x/696x	Introduction to Network Science / Ntwk Resilience
CSCI 496x/696x	*Cognitive Computing*
CSCI 496x (or COGS 4430/6430)	Learning and Advanced Game AI
CSCI 496x (or COGS 4420)	Game AI
CSCI 496x/696x (or COGS 4880/6880)	Language Endowed Intelligent Agents
CSCI 496x/696x (or COGS 4640/6640)	Intelligent Virtual Agents
CSCI 496x/696x	Semantic Web Topics / Knowledge Disc/Extraction
CSCI 496x/696x	Knowledge Discovery and Extraction
CSCI 496x (or COGS 4410/6410)	Programming for Cognitive Science and AI
CSCI 496x (or COGS 4210/6210)	Cognitive Modeling
CSCI 496x (or COGS 496x/696x)	Social Computing
CSCI 496x/696x	ML for Bioinformatics (*Computational Biology*)
CSCI 496x/696x	Advanced Web Science
CSCI 496x/696x	Large-Scale Matrix Computation and ML
CSCI 496x/696x	Machine Learning and Optimization
CSCI 496x/696x	Social Processes & Networks / Econ & Computation
CSCI 496x	AI in Fact and Fiction
CSCI 496x (or COGS 496x/696x)	Information Retrieval
CSCI 496x/696x	Machine Learning Seminar
CSCI 496x/696x	Reinforcement Learning
CSCI 496x/696x	Neurosymbolic Knowledge Graphs
CSCI 496x/696x	Deep Learning on Graphs
CSCI 696x	Large Language Models
ECSE 4850/496x	Introduction to Deep Learning
ECSE 496x	Introduction to Machine Learning
ECSE 6610	Pattern Recognition

(d) Concentration Area: Applications (*formerly Vision, Graphics, Robotics, and Games*)	
CSCI 4270/6270	Computational Vision
CSCI 4320/6360	Parallel Programming/Parallel Computing
CSCI 4480 (or ECSE 4480)	Robotics I
CSCI 4490/6490 (or ECSE 4490/6490*)*	*Robotics II*
CSCI 4520	*Game Development I (phased out Fall 2019)*
CSCI 4530/6530	Advanced Computer Graphics **[CI]**
CSCI 4540	*Game Development II (phased out Fall 2021)*
CSCI 4550/6550	Interactive Visualization **[CI]**
CSCI 4560/6560	Computational Geometry
CSCI 496x/696x	AI for Conservation
CSCI 496x/696x	Projects in Machine Learning and AI
CSCI 496x (or COGS 4430/6430)	Learning and Advanced Game AI
CSCI 496x (or COGS 4420)	Game AI
CSCI 496x/696x	Safe Autonomy
ECSE 4740	Applied Parallel Computing for Engineers
ECSE 4750/696x	*Computer Graphics*
ECSE 4620/6620	Computer Vision for Visual Effects
ECSE 6650	Computer Vision
ECSE 696x	Robot Dynamics and Control
GSAS 4550	Game Architecture