No.	Title	Updated Prerequisites for Graduate Students
CS 501	Introduction to Java Programming	none
CS 503	Discrete Mathematics for Cryptography	Undergraduate course in Discrete Mathematics OR MA 502
CS 506	Introduction to IT Security	Undergraduate course in Discrete Mathematics OR MA 502
CS 510	Principles of Programming Languages	Undergraduate course in Data Structures and Algorithms OR CS 590
CS 511	Concurrent Programming	Undergraduate courses in Systems Programming OR Operating Systems OR CS 520
CS 513	Knowledge Discovery and Data Mining	none
CS 514	Computer Architecture	Undergraduate courses in Computer Organization and Data Structures and Algorithms, OR (CS 550 and CS 570).
CS 515	Introduction to Computer Science	none
CS 516	Compiler Design and Implementation	Required: Undergraduate Automata and Undergraduate Algorithms. Highly recommended: Undergraduate course in Principles of Programming Languages OR CS 510
CS 519	Introduction to E-Commerce	none
CS 520	Introduction to Operating Systems	Undergraduate course in computer architecture (computer organization), data structures and algorithms, and proficiency in programming in Java, C, or C++. OR (CS 550 AND CS 590).
CS 521	TCP/IP Networking	Programming experience in Java, C++ or Python
CS 522	Mobile Systems and Applications	Undergraduate data structures and algorithms and experience in Java or C# OR CS 590.
CS 523	Programming the Internet of Things using iOS	CS 590 OR Undergraduate course in algorithms
CS 524	Introduction to Cloud Computing	An undergraduate course in operating systems OR CS 520.
CS 526	Enterprise and Cloud Computing	Undergraduate data structures and algorithms OR CS 590
CS 532	3D Computer Vision	none
CS 537	Interactive Computer Graphics	Undergraduate data structures and algorithms OR CS 590

CS 539	Real-Time Rendering, Gaming, and Simulation Programming	CS 537
CS 556	Foundations of ML	none
CS 541	Artificial Intelligence	Undergrad linear algebra and probability OR CS 556
CS 544	Health Informatics	none
CS 545	Human-Computer Interaction	Undergraduate data structures and algorithms OR CS 590
CS 546	Web Programming	Prior practical programming experience in at least one high level programming language is required. (Java, Python, JavaScript etc.)
CS 548	Enterprise Software Architecture and Design	Undergraduate data structures and algorithms OR CS 590
CS 549	Distributed Systems and Cloud Computing	Undergraduate data structures and algorithms OR CS 590
CS 550	Computer Organization and Programming	none
CS 553	Intro Text Mining and Statistical NLP	none
CS 554	Web Programming II	CS 546
CS 555	Agile methods for software development	none
CS 557	Intro NLP	none
CS 558	Computer Vision	Undergraduate Linear Algebra and Data Structures and Algorithms; OR (MA 544 OR CS 556) AND CS 590
CS 559	Machine Learning: Fundamentals and Applications	Undergrad linear algebra and probability OR CS 556
CS 560	Statistical Machine Learning	CS 559
CS 561	Database Management Systems I	Undergraduate data structures and algorithms OR CS 590
CS 562	Database Management Systems II	CS 561 or Undergraduate data base management course
CS 570	Introduction to Programming, Data Structures and Algorithms	Undergraduate object oriented programming, or CS 501
CS 573	Fundamentals of Cybersecurity	Undergraduate data structures and algorithms OR CS 590
CS 574	Object-Oriented Analysis and Design	Undergraduate data structures and algorithms OR CS 590

CS 576	Systems Security	CS 631.
CS 577	Reverse Engineering and Application Analysis	CS 631.
CS 578	Privacy in a Networked World	CS 506 OR CS 579 OR CS 594
CS 579	Foundations of Cryptography	CS 503 AND (Undergraduate data structures and algorithms OR CS 590)
CS 581	Online Social Networks	(Undergraduate data structures and algorithms OR CS 590) AND Programming experience in Python
CS 582	Causal Inference	none
CS 583	Deep Learning	CS 556 OR Undergrad linear algebra and probability
CS 584	Natural Language Processing	CS 556 OR undergrad linear algebra and probability
CS 589	Text Mining and Information Retrieval	CS 556 OR undergrad linear algebra and probability, Python programming experience recommended
CS 590	Algorithms	Undergraduate Data Structures OR CS 570
CS 593	Data Mining II: Advanced Algorithms for Big Data	
CS 594	Enterprise and Cloud Security	CS 526 or CS 548 or CS 549 or permission of instructor
CS 595	Information Security and the Law	CS 506 OR CS 594 OR FIN 545
CS 596	Introduction to Windows Programming	CS 631
CS 597	User Experience Design and Programming	none
CS 598	Visual Information Retrieval	Undergraduate data structures and algorithms OR CS 590
CS 600	Advanced Algorithm Design and Implementation	Undergraduate discrete mathematics, and data structures and algorithms OR (MA 502 AND CS 590)
CS 601	Algorithmic Complexity	CS 600
CS 609	Data Management and Exploration on the Web	None

CS 615	Systems Administration	Background in systems programming and operating systems is recommended. Interested students should describe their programming background and experience with Unix; enrollment with permission of the instructor only
CS 631	Advanced Programming in the UNIX Environment	Background in systems programming and operating systems is recommended. Interested students should describe their programming background and experience with Unix; enrollment with permission of the instructor only
CS 638	Advanced Computer Graphics	CS 537
CS 643	Formal Verification of Software	Undergraduate Discrete Mathematics, data structures and algorithms OR CS 600
CS 665	Forensic Analysis	CS 631
CS 676	Advanced Topics in Systems Security	CS 576
CS 677	Parallel Programming for Many-core Processors	CS 537 or CS 511 or CS 631
CS 693	Cryptographic Protocols	CS 579
CS 696	Database Security	(Undergraduate databases or CS 561) AND CS 506.