

**EXPECTED COURSE OFFERINGS
COMPUTER SCIENCE PROGRAM**

The schedule below is based on historical patterns and expected scheduling. The semester and location in which a course may be offered *is subject to change* due to instructor availability, student demand, and the need to provide an appropriate balance of subjects and course levels in all semesters. Courses may be offered at the Applied Physics Laboratory (A), Online (O), Virtual Live (VL), or as an Independent Study (IS), as indicated. Courses may also be offered in odd years (odd) or even years (even).

Course Number	Course Name	Summer	Fall	Spring
Prerequisite Courses				
605.101	Introduction to Python	O	O	O
605.201	Introduction to Programming Using Java	O	O/VL	O/VL
605.202	Data Structures	O/VL	O/VL	O/VL
605.203	Discrete Mathematics		VL	VL
605.204	Computer Organization	O/VL	O/VL	O
605.205	Molecular Biology for Computer Scientists		VL	VL
605.206	Introduction to Programming Using Python	O	O	O
605.207	Introduction to Programming Using C++			VL
605.256	Modern Software Concepts in Python		VL	
Foundation Courses				
605.601	Foundations of Software Engineering	O/VL	O	O/VL
605.611	Foundations of Computer Architecture	O	O/VL	O
605.621	Foundations of Algorithms	O/VL	O	O
Focus Areas and Concentrations				
Artificial Intelligence Bioinformatics Cybersecurity Data Communications and Networking Data Science and Cloud Computing Database Systems and Knowledge Management Enterprise and Web Computing Human-Computer Interaction and Visualization Research Software Engineering Systems Theory				

Independent Study
Communications and Networking Concentration

Courses by Focus Area

	ARTIFICIAL INTELLIGENCE	Summer	Fall	Spring
605.613	Introduction to Robotics		VL	VL
605.624	Logic: Systems, Semantics, and Models			O
605.645	Artificial Intelligence	O	O	O
605.646	Natural Language Processing		O	
605.647	Neural Networks		VL	O
605.649	Principles and Methods in Machine Learning	O	O/VL	O
605.742	Deep Neural Networks	O	O	O
605.743	Advanced Artificial Intelligence		O	
605.745	Reasoning Under Uncertainty		O	
605.746	Advanced Machine Learning	O		O
605.747	Evolutionary and Swarm Intelligence		O	
695.637	Introduction to Assured AI and Autonomy			
705.603	Creating AI-Enabled Systems	O	O	O
525.670	Machine Learning for Signal Processing		O	O
525.733	Deep Learning for Computer Vision			VL
525.786	Human Robotics Interaction			A
	BIOINFORMATICS	Summer	Fall	Spring
605.643	Linked Data and the Semantic Web	O		
605.651	Principles of Bioinformatics		O	
605.652	Biological Databases and Database Tools		O	
605.653	Computational Genomics		O	
605.656	Computational Drug Discovery, Dev		VL	VL
605.657	Statistics for Bioinformatics			O
605.716	Modeling and Simulation of Complex Systems			VL
605.751	Algorithms for Structural Bioinformatics			O
605.755	Systems Biology		O	
605.759	Independent Project in Bioinformatics	IS	IS	IS
585.771	Biomedical Data Science			O
	CYBERSECURITY	Summer	Fall	Spring
605.609	DevOps and Secure Software Development	O	O	O

605.636	Autonomic Computing			VL
605.731	Survey of Cloud Computing Security	O		O
635.673	Protecting Critical Infrastructure Against Cyber Attacks			O
695.601	Foundations of Information Assurance	O	O/VL	O/VL
695.611	Embedded Computer Systems-Vulnerabilities, Intrusions, and Protection Mechanisms		O	O
695.612	Operating Systems Security		VL	VL
695.615	Cyber Physical Systems Security		O	
695.622	Web Security	O	O	O
695.641	Cryptology	O	O	O/VL
695.642	Intrusion Detection	O	O	O
695.643	Introduction to Ethical Hacking	O	O	O
695.711	Java Security		O	
695.721	Network Security		O	VL
695.723	Advanced Web Security		O	
695.742	Digital Forensics Technologies and Techniques		O	VL
695.744	Reverse Engineering and Vulnerability Analysis		O	O
	DATA COMMUNICATIONS AND NETWORKING	Summer	Fall	Spring
605.671	Principles of Data Communications Networks	O	O	A
605.674	Network Programming		O	
605.675	Protocol Design			
605.677	Internetworking with TCP/IP I		O	
605.771	Wired and Wireless Local and Metropolitan Area Networks		O	
605.776	Fourth Generation Wireless Communications: WiMAX and LTE			
605.777	Internetworking with TCP/IP II			O
605.779	Network Design and Performance Analysis		O	
525.678	Next Generation Mobile Networks and Security with 5G		VL	VL
525.768	Wireless Networks			
	DATA SCIENCE AND CLOUD COMPUTING	Summer	Fall	Spring
605.631	Statistical Methods for Computer Science		O	O
605.632	Graph Analytics			O
605.633	Social Media Analytics		O	O
605.634	Crowdsourcing and Human Computation		O	O
605.635	Cloud Computing		O	O

605.649	Principles and Methods in Machine Learning	O	O/VL	O
605.662	Data Visualization	O	O	O
605.724	Applied Game Theory			O
605.731	Survey of Cloud Computing Security	O		O
605.741	Large-Scale Database Systems	O	O	O
605.744	Information Retrieval		O	
605.746	Advanced Machine Learning	O		O
605.788	Big Data Processing Using Hadoop		O	O
625.734	Queuing Theory with Applications to Computer Science			VL
625.741	Game Theory		O even yrs	
685.648	Data Science	O	O	O
	DATABASE SYSTEMS AND KNOWLEDGE MANAGEMENT	Summer	Fall	Spring
605.624	Logic: Systems, Semantics, and Models			O
605.641	Principles of Database Systems	O	O	O
605.643	Linked Data and the Semantic Web	O		
605.644	XML Design Paradigms	O	O	
605.645	Artificial Intelligence	O	O	O
605.646	Natural Language Processing		O	
605.647	Neural Networks		VL	O
605.740	Machine Learning: Deep Learning		O	O
605.741	Large-Scale Database Systems	O	O	O
605.742	Deep Neural Networks	O	O	O
605.744	Information Retrieval		O	
605.745	Reasoning Under Uncertainty		O	
685.648	Data Science	O	O	O
525.733	Deep Learning for Computer Vision			VL
	ENTERPRISE AND WEB COMPUTING	Summer	Fall	Spring
605.681	Principles of Enterprise Web Development	O	O	O/VL
605.682	Web Application Development with Java	O	O	O
605.683	Java Enterprise Development: Processes, Tools and Infrastructure			
605.686	Mobile Application Development for the Android Platform	VL	O	O
605.687	Mobile Application Development for the iOS Platform		O	O
605.691	Entrepreneurship for Computer Scientists		VL	
605.784	Enterprise Computing with Java	O	VL	O

605.786	Enterprise System Design and Implementation			
605.787	Front End Web App Development		O	O
605.788	Big Data Processing Using Hadoop		O	O
605.789	Service API Design and Development	O	O	O
635.683	E-Business: Models, Architecture, Technologies, and Infrastructure		O	VL
	HUMAN-COMPUTER INTERACTION AND VISUALIZATION	Summer	Fall	Spring
605.634	Crowdsourcing and Human Computation		O	O
605.661	Computer Vision			O
605.662	Data Visualization	O	O	O
605.667	Computer Graphics		O	
605.668	Computer Gaming Engines			VL (odd yrs)
605.767	Applied Computer Graphics			VL (even yrs)
605.768	Advanced Game Design and Development Engines		VL	VL
635.661	Principles of Human Computer Interaction		O	
	RESEARCH	Summer	Fall	Spring
605.646	Natural Language Processing		O	
605.728	Quantum Computation		O	
605.745	Reasoning Under Uncertainty		O	
605.746	Advanced Machine Learning	O		O
605.747	Evolutionary and Swarm Intelligence		O	
605.795	Capstone Project in Computer Science			O
605.801	Independent Study in Computer Science I	IS	IS	IS
605.802	Independent Study in Computer Science II	IS	IS	IS
615.781	Quantum Information Processing			O
635.673	Protecting Critical Infrastructure Against Cyber Attacks			O
695.722	Covert Channels	O		
	SOFTWARE ENGINEERING	Summer	Fall	Spring
605.601	Foundations of Software Engineering	O/VL	O	O/VL
605.603	Object-Oriented and Functional Programming in Kotlin			VL
605.604	Object-Oriented Programming with C++	VL	O	O/VL
605.606	Programming with Domain-Specific Languages			
605.607	Agile Software Development Methods		O	O
605.608	Software Project Management	O	O	O
605.609	DevOps and Secure Software Development	O	O	O

605.629	Programming Languages		O	O
605.701	Software Systems Engineering			
605.702	Cloud-native Architecture and Microservices			VL
605.704	Object-Oriented Analysis and Design	O	O	O
605.705	Software Safety		O	O
605.707	Software Patterns		O	VL
605.708	Tools and Techniques of Software Project Management			O
	SYSTEMS	Summer	Fall	Spring
605.611	Foundations of Computer Architecture	O	O/VL	O
605.612	Operating Systems		O	O
605.613	Introduction to Robotics		VL	VL
605.614	System Development in the UNIX Environment		A	O
605.615	Compiler Design with LLVM			VL
605.616	Multiprocessor Architecture & Programming			O
605.617	Introduction to GPU Programming			
605.618	Introduction to High Performance Computing		VL	
605.715	Software Development for Real-Time Embedded Systems		O	O
605.716	Modeling and Simulation of Complex Systems			VL
	THEORY	Summer	Fall	Spring
605.620	Algorithms for Bioinformatics		O	O
605.621	Foundations of Algorithms	O/VL	O	O
605.622	Computational Signal Processing		VL	
605.623	Intro to Enumerative Combinatorics			O
605.624	Logic: Systems, Semantics, and Models			O
605.626	Image Processing	O	O	
605.629	Programming Languages		O	O
605.630	Theory of Computation			O
605.721	Design and Analysis of Algorithms			O
605.724	Applied Game Theory			O
605.727	Computational Geometry			O
605.728	Quantum Computation		O	
605.729	Formal Methods			VL
625.617	Intro to Enumerative Combinatorics			O
625.687	Applied Topology			VL odd yrs

625.690	Computational Complexity and Approximation			O odd yrs
625.692	Probabilistic Graphical Models			O
625.734	Queuing Theory with Applications to Computer Science			VL
625.741	Game Theory		O even yrs	
	INDEPENDENT STUDY	Summer	Fall	Spring
605.795	Capstone Project in Computer Science	IS	IS	IS
605.801	Independent Study in Computer Science I	IS	IS	IS
605.802	Independent Study in Computer Science II	IS	IS	IS
Courses by Concentration				
Communications and Networking Concentration				
Prerequisite				
525.202	Signals and Systems	O	O	O
Electives				
Select seven of the following:		Summer	Fall	Spring
605.671	Principles of Data Communications Networks	O	O	A
605.674	Network Programming		O	
605.675	Protocol Design			
605.677	Internetworking with TCP/IP I		O	
605.771	Wired and Wireless Local and Metropolitan Area Networks		O	
605.776	Fourth Generation Wireless Communications: WiMAX and LTE			
605.777	Internetworking with TCP/IP II			O
695.601	Foundations of Information Assurance	O	O/VL	O/VL
695.622	Web Security	O	O	O
695.721	Network Security		O	VL
525.608	Next Generation Telecommunications		VL	
525.614	Probability & Stochastic Processes for Engineers	O	O/VL	O/VL
525.616	Communication Systems Engineering	O	O/VL	O/VL
525.618	Antenna Systems		O	O
525.620	Electromagnetic Transmission Systems		VL (even yrs)	
525.638	Introduction to Wireless Technology		O	
525.640	Satellite Communications Systems		O	O
525.641	Computer and Data Communication Networks I		VL	VL
525.678	Next Generation Mobile Networks and Security with 5G		VL	VL
525.707	Error Control Coding			O

525.708	Iterative Methods in Communications Systems		VL	
525.722	Wireless and Mobile Cellular Communications		O	O
525.735	MIMO Wireless Communications			O
525.738	Advanced Antenna Systems	O		
525.747	Speech Processing			VL
525.751	Software Radio for Wireless Communications		O	O
525.754	Wireless Communication Circuits			A
525.759	Image Compression, Packet Video, and Video Processing		O	
525.761	Wireless and Wireline Network Integration	VL		
525.768	Wireless Networks			
525.771	Propagation of Radio Waves in the Atmosphere		VL	
525.772	Fiber-Optic Communication Systems		VL	
525.776	Information Theory			O
525.783	Spread Spectrum Communications	O	O	
525.789	Advanced Satellite Communications			VL
525.791	Microwave Communications Lab	A		
525.793	Advanced Communication Systems			O