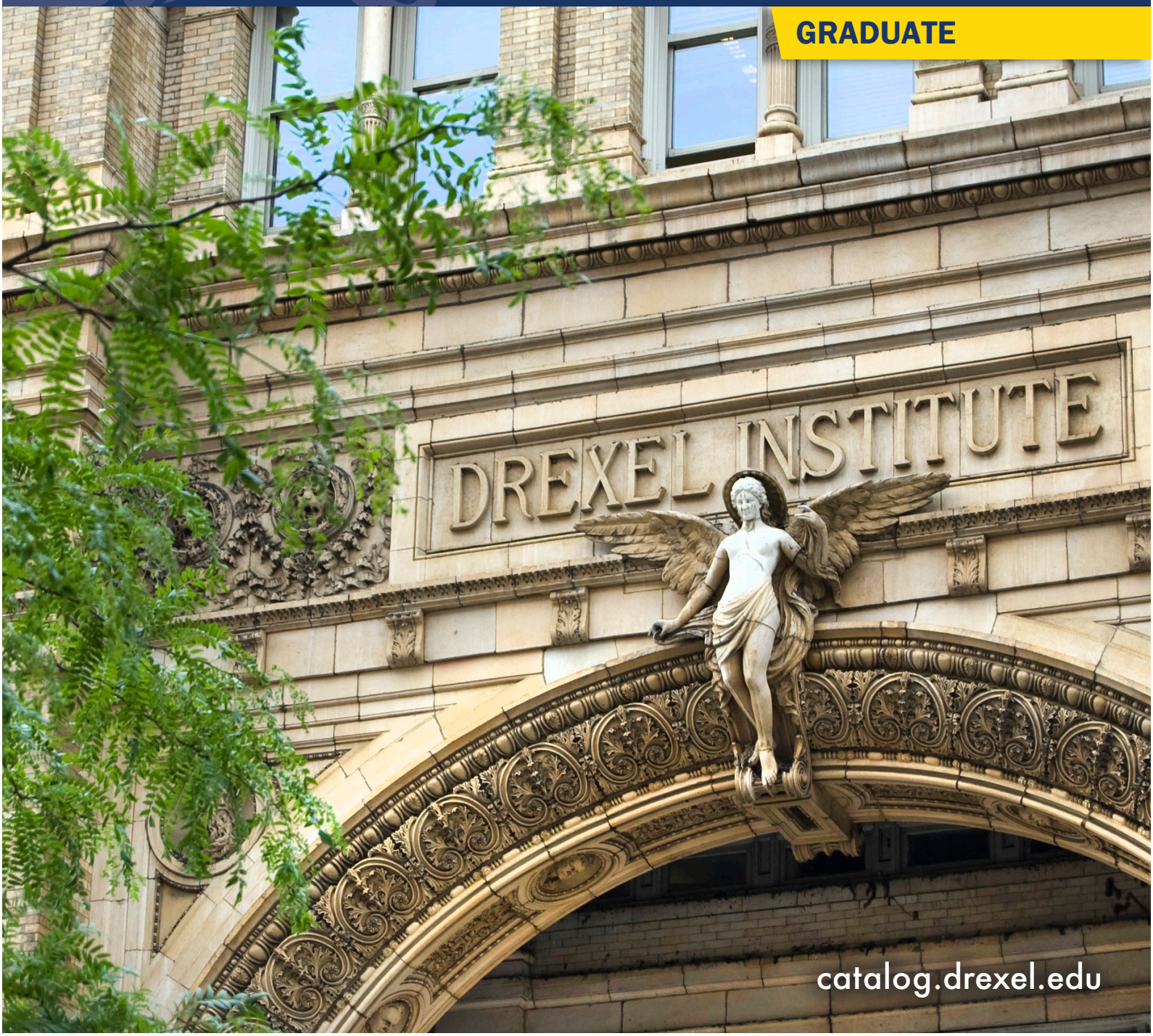
DREXEL UNIVERSITY
College of
Computing & Informatics

CATALOG
2024-2025

GRADUATE



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College of Computing & Informatics

At Drexel University's College of Computing & Informatics (CCI), you'll experience ingenuity at work – and a fierce intensity to invent the best future through technology.

From our position on the leading edge of information and technology, Drexel CCI instills the knowledge and skills necessary for our students to lead and innovate across industries in a rapidly evolving technological landscape.

Building on Drexel University's exceptional foundation of entrepreneurship and cooperative education, we provide unparalleled professional experiences and on-the-job training that is vital to preparing today's students for tomorrow's world. At CCI, our unique structure bringing computing and informatics together under one roof in a dynamic, collaborative college allows us to spot trends before they emerge, to solve problems before they occur, and to build a better tomorrow starting today.

The College contributes to theory and practice along dimensions that include technical, human, organizational, policy, and societal considerations. This broad perspective positions the College to address the complex, multi-disciplinary problems that are increasingly common as society becomes more dependent on information technology.

The College's academic programs provide broad and deep coverage of computing and informatics. For more information about the College, please visit the College's website (https://drexel.edu/cci/).

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College of Computing & Informatics Faculty

Adelaida Alban Medlock, MS *(Drexel University) Associate Department Head for Undergraduate Affairs, Computer Science*. Teaching Professor. Introductory programming, computer science education

Yuan An, PhD *(University of Toronto, Canada) Director of International Programs*. Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web.

Ram Arthanari, PhD *(Temple University)*. Assistant Teaching Professor. Knowledge Management, Digital Transformation, Project/Program/Portfolio Management, Risk Management, Cloud Computing, AI

Pragati Awasthi, MS *(Drexel University)*. Assistant Teaching Professor. Data Science, machine learning and applications.

Ellen Bass, PhD *(Georgia Institute of Technology) Interim Senior Associate Dean for Research*. Professor. Characterizing human judgement and decision making, modeling human judgement when supported by information automation, computational models of human-human and human-automation coordination, design and evaluation of interventions to improve human judgement and decision making.

Karthik Bhat Assistant Professor. Human-Centered Computing, Human-Centered AI, Care Work, ICTD

Mark Boady, PhD *(Drexel University)*. Associate Teaching Professor. Computer Algebra, complex symbolic calculations, automation of computation problems

David E. Breen, PhD *(Rensselaer Polytechnic Institute) Associate Department Head for Graduate Affairs, Computer Science*. Professor. Computer-aided design, biomedical image informatics, geometric modeling and self-organization algorithms.

Matthew Burlick, PhD *(Stevens Institute of Technology)*. Associate Teaching Professor. Image processing, machine learning, real-time video tracking, object detection and classification, statistics/probability, and acoustics

Yuanfang Cai, PhD *(University of Virginia)*. Professor. Formal software design modeling and analysis, software economics, software evolution and modularity.

Andrew Calhoun, MS *(American Military University)*. Assistant Teaching Professor. Social engineering, ethical hacking, information assurance, business continuity & disaster recovery planning, Computer forensics, and Computer security

Christopher Carroll, MS *(Drexel University) BSCST Program Director*. Teaching Professor. Information technology within healthcare companies, computer networking and design, IT infrastructure, server technology, information security, virtualization and cloud computing.

Preetha Chatterjee, PhD *(University of Delaware)*. Assistant Professor. Software engineering, data mining, natural language processing, and machine learning.

Chaomei Chen, PhD *(University of Liverpool)*. Professor. Information visualization, visual analytics, knowledge domain visualization, network analysis and modeling, scientific discovery, science mapping, scientometrics, citation analysis, human-computer interaction.

Trip Denton, PhD *(Drexel University)*. Assistant Teaching Professor. Computer Science

Tiffany Do Assistant Professor. Human-Centered AI, Virtual Avatars, Virtual Reality

Michael Ekstrand, PhD *(University of Minnesota)*. Assistant Professor. Recommender systems, information retrieval, algorithmic fairness, social impact of technology, AI ethics.

Joseph Gallego Assistant Teaching Professor. Computer vision, remote sensing, machine learning, quantum machine learning, natural language processing.

Vasilis Gkatzelis, PhD *(New York University)*. Associate Professor. Algorithmic mechanism design, multiagent resource allocation, approximation, algorithms.

Colin Gordon, PhD *(University of Washington)*. Associate Professor. Software reliability, program behavior, concurrent and systems-level code, formal assurance, programming models, distributed computing, and testing

Tim Gorichanaz, PhD *(Drexel University)*. Associate Teaching Professor. Human information behavior, human-centered computing, neo-documentation studies, and information ethics.

Jane Greenberg, PhD *(University of Pittsburgh) Alice B. Kroeger Professor and Director Metadata Research Center*. Metadata, ontological engineering, data science, knowledge organization, information retrieval

Sean Grimes, PhD *(Drexel University)*. Assistant Teaching Professor. Swarm intelligence, biologically inspired AI, multi-agent systems, software system design.

Scott Haag, PhD *(Drexel University)*. Assistant Research Professor. Remote sensing object classification, object segmentation, machine learning classifiers, algorithm design and complexity analysis, relational database development, statistical analysis, the design and deployment of Application Program Interfaces (API), and combinatoric geometric modelling.

Thomas Heverin, PhD *(Drexel University)*. Associate Teaching Professor. Computer security, ethical hacking, computer forensics, network forensics, cloud security and cybersecurity.

Gregory W. Hislop, PhD *(Drexel University)*. Professor. Information technology for teaching and learning, online education, structure and organization of the information disciplines, computing education research, software evaluation and characterization.

Xiaohua Tony Hu, PhD *(University of Regina, Canada)*. Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics, and healthcare informatics.

Shahin Jabbari, PhD *(University of Pennsylvania)*. Assistant Professor. Algorithmic fairness, game theory, and artificial intelligence for social good.

Jeremy R. Johnson, PhD *(Ohio State University) Department Head, Computer Science*. Professor. Computer algebra; parallel computations; algebraic algorithms; scientific computing.

Weimao Ke, PhD *(University of North Carolina at Chapel Hill) Associate Department Head for Graduate Affairs, Information Science*. Associate Professor. Information retrieval, distributed systems, intelligent filtering/recommendation, information visualization, network science, complex systems, machine learning, text/data mining, multi-agent systems, the notion of information.

Mat Kelly, PhD *(Old Dominion University)*. Assistant Professor. Information retrieval, Web archives, metadata, digital humanities, archival privacy

Ehsan B. Khosroshahi, PhD *(Drexel University)*. Assistant Teaching Professor. Computational cognitive modeling, artificial intelligence, machine learning and data analysis.

Edward Kim, PhD *(Lehigh University)*. Associate Professor. Computer vision, Sparse coding, neuromorphic computing, medical image processing, computer graphics, artificial intelligence, game development

Feng Liu Assistant Professor. AI + X: Education; Healthcare. 3D Computer Vision: 3D object/scene understanding; 3D generation; VR/AR; 3D vision +language understanding. 3D Human Digitization: Modeling, reconstruction and rendering; Biomechanics. Generative AI: Explainability, generalization and controllability in generative models; DeepFake detection. Biometric Recognition: Face and gait recognition; Person re-identification

Galen Long, MS *(Drexel University)*. Assistant Teaching Professor. Computer Science.

Geoffrey Mainland, PhD *(Harvard University)*. Associate Professor. Programming systems and software engineering, high-level programming languages and runtime support for non-general purpose computation.

Spiros Mancoridis, PhD *(University of Toronto) The Auerbach Berger Chair in Cybersecurity Distinguished Professor of Computer Science*. Professor. Software engineering; software security; code analysis; evolutionary computation.

Helena Mentis, PhD *(Pennsylvania State University) Department Head, Information Science*. Professor. Human-computer interaction (HCI), computer supported cooperative work (CSCW), health informatics, AR/VR

Brian Mitchell, PhD *(Drexel University)*. Teaching Professor. Software engineering, software architecture, systems, cloud native computing.

Daniel Moix, MS *(Arkansas State University)*. Associate Teaching Professor. Computer science education.

Reza Moradinezhad, PhD *(Drexel University)*. Assistant Teaching Professor. Generative AI, human-AI trust, ethical AI.

Santiago Ontañón, PhD *(University of Barcelona)*. Associate Professor. Game AI, computer games, artificial intelligence, machine learning, case-based reasoning

Yusuf Osmanlioglu, PhD *(Drexel University)*. Assistant Teaching Professor. Graph theory and algorithms, brain network analysis, optimization, computer vision, natural language processing.

Jung-ran Park, PhD *(University of Hawaii at Manoa)*. Associate Professor. Knowledge organization and representation, metadata, computer-mediated communication, cross-cultural communication, multilingual information access, discourse and pragmatics.

Chad Peiper, PhD *(University of Ilinois)*. Associate Teaching Professor. Cloud computing, blockchain, self-sovereign identity, data privacy, decentralization.

Shruti Phadke Assistant Professor. Computational social science, social computing, natural language processing, human-computer interaction

Tammy Pirmann, Ed D *(Gwynedd Mercy University)*. Assistant Teaching Professor. Introductory programming, object-oriented programming, game design, mobile computing, computer science education, computer science educator pipeline

Alex Poole, PhD *(University of North Carolina)*. Associate Professor. Digital curation, archives and records management, digital humanities, and diversity, inclusivity, and equity.

Emmanouil Pountourakis, PhD *(Northwestern University)*. Assistant Professor. Algorithmic game theory, algorithmic mechanism design, algorithmic aspects of behavioral economics, game theory and learning, computational and game theoretic aspects of energy grids.

Afsaneh Razi, PhD *(University of Central Florida)*. Assistant Professor. Human-computer interaction, social computing, human-centered AI, privacy, ethics, online safety, language processing.

Shadi Rezapour, PhD *(University of Ilinois)*. Assistant Professor. Computational social science, natural language processing, network analysis, human-centered data science, computational linguistics.

Michelle L. Rogers, PhD *(University of Wisconsin-Madison) Directotr, Women in Tech Initiative*. Associate Professor. Human-computer interaction, healthcare informatics, human factors engineering, socio-technical systems, health services research, patient safety.

Jeffrey Salvage, MS *(Drexel University)*. Teaching Professor. Object-oriented programming, multi-agent systems, software engineering, database theory, introductory programming, data structures.

Dario Salvucci, PhD *(Carnegie Mellon University) Interim Associate Dean for Academic Operations*. Professor. Human computer interaction, cognitive science, machine learning, applications for driving.

Aleksandra Sarcevic, PhD *(Rutgers University)*. Professor. Computer-supported cooperative work, human-computer interaction, and healthcare informatics.

Kurt Schmidt, MS *(Drexel University)*. Associate Teaching Professor. Data structures, math foundations for computer science, programming tools, programming languages.

John Seberger, PhD *(University of California, Irvine)*. Assistant Professor. Human-computer interaction, human-centered computing, social informatics, privacy.

Bhupesh Shetty, PhD *(University of Iowa) Associate Department Head for Undergraduate Affairs, Information Science.*. Associate Teaching Professor. Process pattern mining, data mining, operations management, sports analytics, information systems, and machine learning applications.

Ali Shokoufandeh, PhD *(Rutgers University) Interim Dean*. Distinguished University Professor. Theory of algorithms, graph theory, combinational optimization, computer vision.

Il-Yeol Song, PhD *(Louisiana State University)*. Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-oriented analysis and design with UML, medical and bioinformatics data modeling & integration.

Bo Song, PhD *(Drexel University)*. Assistant Teaching Professor. Data mining, bioinformatics, big data analytics and knowledge discovery.

Brian Stuart, PhD *(Purdue University)*. Associate Teaching Professor. Machine learning, networking, robotics, image processing, simulation, interpreters, data storage, operating systems, computer science, data communications, distributed/operating systems, accelerated computer programming, computer graphics.

Nadia Sultanik, MS *(Drexel University)*. Assistant Teaching Professor. Computer Science

Eric Sun, PhD *(Arizona State University)*. Assistant Professor. Computer security and privacy.

Hegler Tissot, PhD *(Universidade Federal do Parana)*. Assistant Teaching Professor. Knowledge representation and reasoning, machine learning, natural language processing, ontologies, pattern recognition, statistical analysis, and information extraction, health informatics.

Milad Toutounchian, PhD *(Simon Fraser University)*. Assistant Teaching Professor. Data science, applied machine learning and deep learning.

Boris Valerstein, MS *(Pennsylvania State University)*. Assistant Teaching Professor. Computer science.

Filippos Vokolos, PhD *(Polytechnic University)*. Associate Teaching Professor. System architecture, principles of software design and construction, foundations of software engineering, software verification & validation, software design, programming languages, dependable software systems.

Lei Wang, PhD *(Drexel University)*. Assistant Teaching Professor. Biomedical data science, machine learning, deep learning, neuroimaging processing & analytics, natural language processing, simulation modeling.

Rosina Weber, PhD *(Federal University of Santa Catarina in a "sandwich" program with University of South Florida)*. Professor. Case-based reasoning, explainable artificial intelligence, machine learning, textual analytics, natural language understanding, language models, recommender systems, technological aspects of knowledge management, project management, and requirements engineering.

Heather Willever-Farr Assistant Teaching Professor. Library science pedagogy, digital archives, user experience and information systems, online information-seeking behaviors, data curation

Jake Williams, PhD *(University of Vermont)*. Associate Professor. Data science, scientific programming, computational social science, computational linguistics and natural language processing, mathematics, machine learning, algorithms, and scalability.

Kaidi Xu, PhD *(Northeastern University)*. Assistant Professor. AI security, explainable artificial intelligence, optimization.

Erija Yan, PhD *(Indiana University Bloomington)*. Associate Professor. Network Science, information analysis and retrieval, scholarly communication methods and applications.

Christopher C. Yang, PhD *(University of Arizona)*. Professor. Web search and mining, security informatics, knowledge management, social media analytics, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library, and electronic commerce.

Yue Zhang, PhD *(Jinan University)*. Assistant Professor. IoT Security, Mobile Security, Program Analysis

Li "Harry" Zhang Assistant Professor. Natural Language Processing, Large Language Models, Artificial Intelligence, AI and Games, AI and Creativity

Emeritus Faculty

Michael E. Atwood, PhD *(University of Colorado)*. Professor Emeritus. Human-computer interaction, computer-supported cooperative work, organizational memory.

Bruce W. Char, PhD *(University of California-Berkeley)*. Professor Emeritus. Symbolic mathematical computation, algorithms and systems for computer algebra, problem-solving environments parallel and distributed computation.

Thomas A. Childers, PhD *(Rutgers University)*. Professor Emeritus. Measurement, evaluation, and planning of information and library services, the effectiveness of information organizations.

Yi Deng, PhD *(University of Pittsburgh) Dean Emeritus*. Distinguished University Professor. Computing and informatics

David E. Fenske, PhD *(University of Wisconsin-Madison)*. Dean Emeritus and Professor. Digital libraries, informatics, knowledge management and information technologies.

Susan Gasson, PhD *(University of Warwick)*. Associate Professor. The co-design of business and IT-systems, distributed cognition & knowledge management in boundary-spanning groups, human-centered design, social informatics, online learning communities, grounded theory.

Peter Grillo, PhD *(Temple University)*. Teaching Professor. Software economics, Project management, strategic applications of technology within organizations.

John B. Hall, PhD *(Florida State University)*. Professor Emeritus. Academic library service, library administration, organization of materials.

Xia Lin, PhD *(University of Maryland at College Park)*. Professor. Digital libraries, information visualization, visual interface design, knowledge mapping, human-computer interaction, information retrieval, information architecture, informetrics, information-seeking behaviors in digital environments.

Katherine W. McCain, PhD *(Drexel University)*. Professor Emeritus. Scholarly communication, information production and use in the research process, development and structure of scientific specialties, diffusion of innovation, bibliometrics, evaluation of information retrieval systems.

Carol Hansen Montgomery, PhD *(Drexel University) Dean of Libraries Emeritus*. Research Professor. Selection and use of electronic collections, evaluation of library and information systems, digital libraries, economics of libraries and digital collections.

Delia Neuman, PhD *(The Ohio State University)*. Professor Emerita. Learning in information-rich environments, instructional systems design, the use of media for learning, and school library media.

Danuta A. Nitecki, PhD *(University of Maryland at College Park)*. Professor. Library metrics and use in management, library as place, and academic library service models.

Jeffrey L. Popyack, PhD *(University of Virginia)*. Professor. Operations research, stochastic optimization, computational methods of Markov decision processes; artificial intelligence, computer science education.

Gerry Stahl, PhD *(University of Colorado)*. Professor Emeritus. Human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, theory of collaboration.

Howard D. White, PhD *(University of California at Berkeley)*. Professor Emeritus. Literature information systems, bibliometrics, research methods, collection development, online searching.

Artificial Intelligence and Machine Learning MSAIML

Major: Artificial Intelligence and Machine Learning
Degree Awarded: Master of Science in Artificial Intelligence and Machine Learning (MSAIML)
Calendar Type: Quarter
Minimum Required Credits: 45.0-46.0
Co-op Option: Available for full-time, on-campus master's-level students
Classification of Instructional Programs (CIP) code: 11.0701
Standard Occupational Classification (SOC) code: 15-0000

About the Program

The Master of Science in Artificial Intelligence and Machine Learning provides a strong foundation in the artificial intelligence and machine learning fields with foci on mathematical foundations, algorithms, tools, and applications as they pertain to artificial intelligence and machine learning. Students will pursue an applied or computational track and will gain competency in fundamental methods and techniques in artificial intelligence and machine learning. Their fundamental understanding will be applied to real data sets and data analysis tasks with the help of state-of-the-art technologies, tools, and platforms.#The Master of Science in Artificial Intelligence and Machine Learning program culminates with a two-term capstone experience where students work on a real world or research problem using the knowledge they have gained throughout the program.

Note that this degree has two concentrations available: computational and applied. Please refer to the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-artificial-intelligence-machine-learning/) for complete information.

A graduate co-op is available; for more information, visit the Steinbright Career Development Center's website (https://drexel.edu/scdc/co-op/graduate/).

Admission Requirements

The Master of Science in Artificial Intelligence and Machine Learning accepts applicants who hold a four-year bachelor's degree or master’s degree from a regionally accredited institution in computer science, software engineering, or related STEM degree, plus work experience equal to Drexel's Post-Baccalaureate Certificate in Computer Science Foundations (p. 54). Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-artificial-intelligence-machine-learning/) for more information on admission requirements.

Additional Information

For more information about this program, visit the College of Computing & Informatics MS in Artificial Intelligence and Machine Learning webpage (https://drexel.edu/cci/academics/masters-programs/ms-in-artificial-intelligence-machine-learning/).

Degree Requirements

Core Courses		
Choose appropriate core courses for concentration:		9.0
Applied		
CS 501	Introduction to Programming	
or CS 570	Programming Foundations	
CS 614	Applications of Machine Learning	
INFO 629	Applied Artificial Intelligence	
Computational		
CS 510	Introduction to Artificial Intelligence	
CS 613	Machine Learning	
CS 615	Deep Learning	
Major Specific Electives		**15.0**
Choose five courses with at least one course from each group, for the appropriate concentration.		
Applied		
Data Science Foundations		
DSCI 501	Quantitative Foundations of Data Science	
DSCI 511	Data Acquisition and Pre-Processing	
DSCI 521	Data Analysis and Interpretation	
DSCI 631	Applied Machine Learning for Data Science	
DSCI 632	Applied Cloud Computing	
DSCI 641	Recommender Systems for Data Science	
INFO 623	Social Network Analytics	
INFO 659	Introduction to Data Analytics	
AI Foundations		
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	

CS 510	Introduction to Artificial Intelligence	
CS 613	Machine Learning	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 612	Knowledge-based Systems	
INFO 692	Explainable Artificial Intelligence	
Human-Centered Computing		
CT 620	Security, Policy and Governance	
INFO 508	Information Innovation through Design Thinking	
INFO 590	Foundations of Data and Information	
INFO 608	Human-Computer Interaction	
INFO 693	Human–Artificial Intelligence Interaction	
INFO 725	Information Policy and Ethics	
Computational *		
Data Science and Analytics		
CS 660	Data Analysis at Scale	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 511	Data Acquisition and Pre-Processing	
DSCI 521	Data Analysis and Interpretation	
DSCI 631	Applied Machine Learning for Data Science	
DSCI 632	Applied Cloud Computing	
INFO 623	Social Network Analytics	
INFO 659	Introduction to Data Analytics	
Algorithmic Foundations		
CS 521	Data Structures and Algorithms I	
CS 522	Data Structures and Algorithms II	
CS 525	Theory of Computation	
CS 540	High Performance Computing	
CS 567	Applied Symbolic Computation	
CS 616	Robust Deep Learning	
CS 770	Topics in Artificial Intelligence	
ECES 521	Probability & Random Variables	
MATH 504	Linear Algebra & Matrix Analysis	
MATH 510	Applied Probability and Statistics I	
Applications of AI/ML		
CS 583	Introduction to Computer Vision	
CS 589	Responsible Machine Learning	
CS 610	Advanced Artificial Intelligence	
CS 611	Game Artificial Intelligence	
CS 614	Applications of Machine Learning	
CS 618	Algorithmic Game Theory	
CS 630	Cognitive Systems	
DSCI 641	Recommender Systems for Data Science	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 629	Applied Artificial Intelligence	
INFO 693	Human–Artificial Intelligence Interaction	
BMES 547	Machine Learning in Biomedical Applications	
ECE 612	Applied Machine Learning Engineering	
ECE 613	Neuromorphic Computing	
Flexible Electives		**15.0**
Choose 5 additional courses, which may include:		
Any graduate-level courses within the College (CI, CS, CT, DSCI, INFO, SE)		
Up to 6 credits of independent study		
Up to 6 credits of related graduate-level coursework outside of the College, with prior approval by the College		
Capstone Courses		
CS 591	Artificial Intelligence and Machine Learning Capstone I	3.0
CS 592	Artificial Intelligence and Machine Learning Capstone II	3.0
Optional Coop Experience		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students *	
Total Credits		**45.0-46.0**

*

For the Computational concentration, at least 2 of these courses must be CS courses.

**

Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete: COOP 500. The total credits required for this degree with the co-op experience is 46.0.
Students not participating in the co-op experience will need 45.0 credits to graduate.

Sample Plan of Study

Part time, No co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Core Courses	6.0	Core Course	3.0	Major Specific Electives	6.0	Major Specific Elective	6.0
		Major Specific Elective	3.0				
	6		**6**		**6**		**6**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Flexible Electives	6.0	Flexible Electives	6.0	CS 591	3.0	CS 592	3.0
				Flexible Elective	3.0		
	6		**6**		**6**		**3**

Total Credits 45

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Full time, With Co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
COOP 500	1.0	Core Course	3.0	Major Specific Electives	6.0	Flexible Electives	6.0
Core Courses	6.0	Major Specific Electives	6.0	Flexible Elective	3.0	CS 591	3.0
Major Specific Electives	3.0						
	10		**9**		**9**		**9**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
COOP EXPERIENCE		COOP EXPERIENCE		CS 592	3.0
				Flexible Elective	6.0
	0		**0**		**9**

Total Credits 46

3675 Market Street

The College of Computing & Informatics is located at 3675 Market (https://drexel.edu/cci/about/our-facilities/). Occupying three floors in the modern uCity Square building, CCI's home offers state-of-the-art technology in our classrooms, research labs, offices, meeting areas and collaboration spaces. 3675 Market offers Class A laboratory, office, coworking, and convening spaces. Located at the intersection of Market Street and 37th Street, 3675 Market acts as a physical nexus, bridging academic campuses and medical centers to the east and south, the commercial corridors along Market Street and Chestnut Street, and the residential communities to the north and west.

The uCity Square building offers:

- Speculative lab/office space
- World-class facilities operated by CIC (https://cic.us/philadelphia/)
- Café/restaurant on-site
- Quorum, a two-story, 15K SF convening space and conference center
- Adjacent to future public square
- Access to Science Center’s nationally renowned business acceleration and technology commercialization programs

Drexel University Libraries

The Drexel University Libraries (https://www.library.drexel.edu/) is a one-stop resource for all members of the Drexel community, providing access to millions of print and online books, journals, databases and other media, as well as hundreds of online course and research guides (https://libguides.library.drexel.edu/libraryguides/), workshops (https://www.library.drexel.edu/news-and-events/events/), and tutorials (https://libguides.library.drexel.edu/tutorials/). Expert librarians offer a variety of consultation services (https://www.library.drexel.edu/research-support/librarians-

subject/) virtually or in person, including help with course-related projects, strategies for finding and evaluating authoritative information, and approaches to utilizing, organizing, and presenting scholarship.

Students in the College of Computing & Informatics also have access to the W. W. Hagerty Library (https://www.library.drexel.edu/about/locations/) where they can take advantage of the Libraries' various learning environments (https://www.library.drexel.edu/services/reserve-room/), including group study rooms, collaborative and silent study areas, and 24/7 study space in the Dragons' Learning Den. The Libraries also offers a wellness room (https://www.library.drexel.edu/news-and-events/programs-and-initiatives/Wellness-Room/), printing and scanning services (https://www.library.drexel.edu/services/printing-scanning-computing/), and laptops, portable power chargers, (https://www.library.drexel.edu/services/printing-scanning-computing/equipment-loan/) and other equipment you can borrow for use in the Library.

CCI Commons

Located on the 10th floor of 3675 Market Street, the CCI Commons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing, and more collaborative space for its students. Students have access to 3675 Market's fully equipped conference room with 42" displays and videoconferencing capabilities. The CCI Commons provides technical support to students, faculty, and professional staff. In addition, the staff provides audio-visual support for all presentation classrooms within 3675 Market. Use of the CCI Commons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library-related resources may be accessed at the CCI Commons and through the W.W. Hagerty Library. The College is a member of the "Azure Dev Tools for Teaching" platform that allows students free access to a wide array of Microsoft software titles and operating systems.

The CCI Commons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University's network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Computer Support for Teaching

The CCI server room houses a multitude of servers to support faculty research, staff operations, and student learning. Services provided include a Linux compute cluster which is open to all faculty, staff, and students, multiple virtualization environments to meet different needs of faculty, staff, and students, and other single-purpose servers to support various operations throughout the college. The compute cluster provides a common environment for students to develop software, which makes testing easier for the TAs and faculty. Our virtualization environments allow college members the flexibility of a cloud environment with local support and direct cost recovery options. For those who need dedicated hardware, we also support dedicated research systems.

Classrooms are outfitted with laser projectors, 4K displays, class capture hardware, and the Wolfvision Cynap. The Cynap controls the AV distribution throughout the room and can display up to 4 streams simultaneously. These include the local PC, a laptop connected directly to the podium, or up to 4 streaming devices. Windows, macOS, iOS and Android devices can all connect wirelessly to the presentation system, allowing collaboration and freedom to roam the classroom for better interactivity. Wireless networking and outlets are also available for students throughout the classrooms. Laptops are available for checkout from the CCI Commons desk.

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CCI continues to invest in these virtual environments, and explores emerging environments, to continue to best support CCI research and teaching. CPU cores, storage, and memory are added at every opportunity to these flexible, scalable environments. The current capacity of the system includes:

- 1760 CPU Cores
- 6 TB of Memory
- Over 556 TB of HDD-backed storage
- 122 TB of high-performance SSD-backed storage
- 12 GPUs with room for expansion through funded research for high-performance computing needs

CCI Learning Center

The CCI Learning Center (CLC), located in 3675 Market Street's CCI Commons student computer lab, provides consulting and other learning resources for students taking courses offered by the Computer Science Department. The CLC is staffed by graduate and undergraduate computer science students from the College of Computing & Informatics.

The CLC and CCI Commons serve as a central hub for small group work, student meetings, and TA assistance.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, in 3675 Market Street including: the Metadata Research Center (MRC), Interactive Systems for Healthcare (IS4H) Research, Economics and Computation (EconCS), The TeX-Base Lab, SPiking And Recurrent SoftwarE (SPARSE) Coding, Human-System Evaluation and Analysis Lab (H-SEAL), Applied Symbolic Computation Laboratory (ASYM), Security and Privacy Analytics Lab (SePAL), Software Engineering and Analytics Research (SOAR), Software Engineering Research Group (SERG), Social Computing Research Group, Vision and Cognition Laboratory (VisCog). For more information on these laboratories, please visit the College's research web page (https://drexel.edu/cci/research/overview/).

Business Information Technology MSBIT

Major: Business Information Technology
Degree Awarded: Master of Science in Business Information Technology (MSBIT)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Classification of Instructional Programs (CIP) code: 11.0103
Standard Occupational Classification (SOC) code: 11-3031

About the Program

The STEM-designated Master of Science in Business Information Technology (MSBIT) prepares students for work related to applying information technology in organizations. Jointly offered by the College of Computing & Informatics (https://drexel.edu/cci/academics/masters-programs/ms-business-information-technology/) and the LeBow College of Business (https://www.lebow.drexel.edu/academics/graduate/specialized-masters-programs/business-it/), the program is thoroughly interdisciplinary. It connects business and information technology perspectives so that students understand information technology in an organizational context. Specifically, students completing the program will understand how information technology is managed in an organizational environment, how it helps to solve organizational problems and how it can be used to transform an organization.

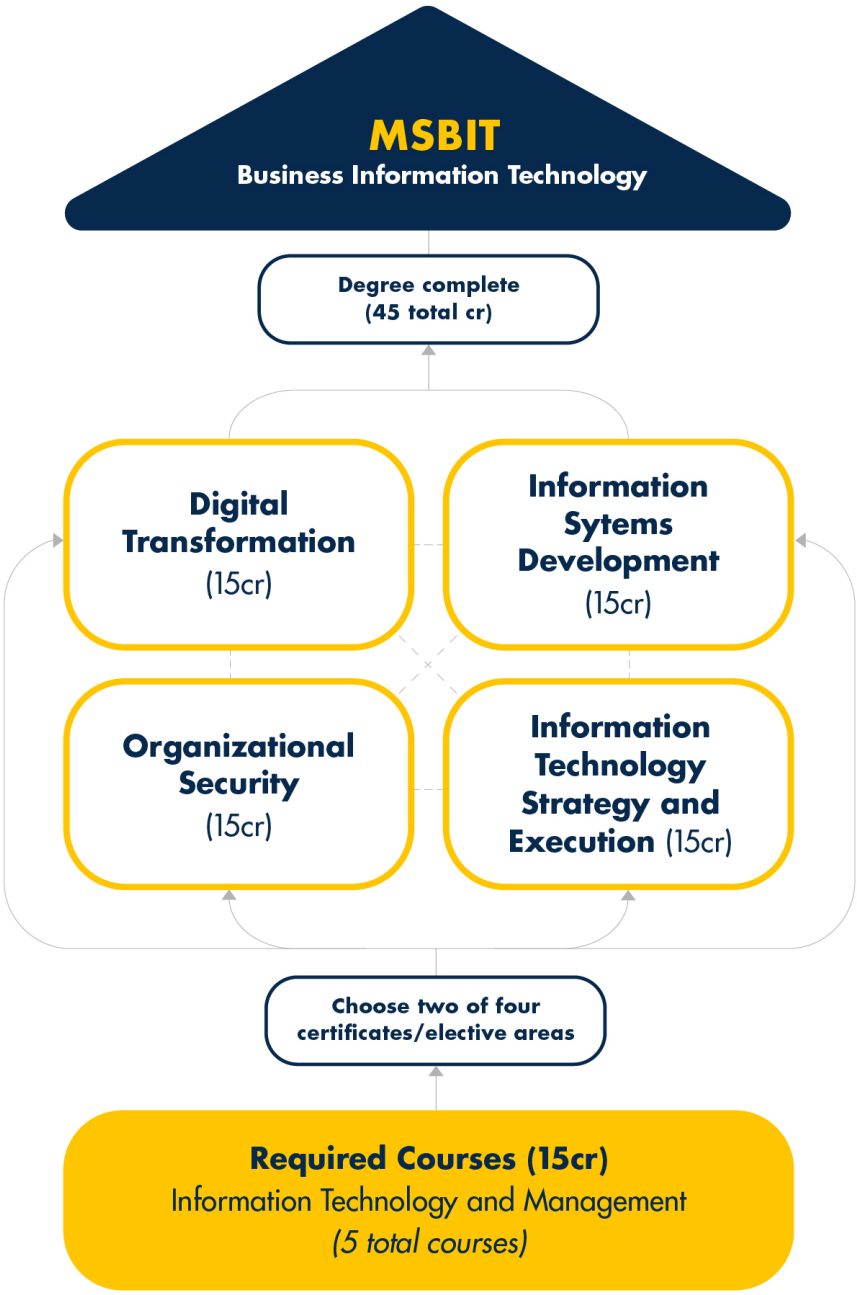
The program is designed for students who have relevant work experience and either a technical or a business background. Courses provide technology and business knowledge with a practical emphasis. To complement required foundations in information technology and management, students can choose to focus on two of the following areas: digital transformation, information systems development, information technology strategy and execution, or organizational security.

Additional Information

For more information please contact our Graduate Student Services department at lebowgradenroll@drexel.edu or the College of Computing & Informatics at cciinfo@drexel.edu.

Pathways to Completion

As the graphic below indicates, students have different pathways to earning the MSBIT.



Degree Requirements

Required Courses - Information Technology & Management		
CT 500	Introduction to the Digital Environment	3.0
CT 600	Cloud Technology	3.0
CT 610	Disaster Recovery, Continuity Planning and Digital Risk Assessment	3.0
MIS 615	Aligning Information Technologies and Operations	3.0
MIS 625	Management of Information Technology Operations	3.0
Choose 2 of the following elective areas		**30.0**
Organizational Security		
CT 605	Cloud Security and Virtual Environments	
CT 620	Security, Policy and Governance	

INFO 517	Principles of Cybersecurity
INFO 710	Information Forensics
INFO 712	Information Assurance
Information Technology Strategy & Execution	
MIS 612	Aligning Information Systems and Business Strategies
MIS 641	MIS Policy and Strategy
ORGB 602	Leading and Executing Change
SE 630	Software Engineering Economics
SE 638	Software Project Management
Information Sytems Development	
CT 630	Application Software Construction and Operation
INFO 540	Perspectives on Information Systems
INFO 605	Database Management Systems
MIS 624	Systems Analysis & Design
MIS 652	Business Agility and IT
Digital Transformation	
MGMT 602	Innovation Management
MGMT 603	Technology Strategy
MIS 642	Emerging Information Technologies in Business
MIS 643	Digital Platform Management
MIS 653	Design Thinking for Digital Innovations
Total Credits	**45.0**

Sample Plan of Study

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
CT 500	3.0	CT 600	3.0	CT 610	3.0	MIS 615	3.0
Elective Area 1	3.0	Elective Area 2	3.0	Elective Area 1	3.0	Elective Area 2	3.0
	6		**6**		**6**		**6**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
MIS 625	3.0	Elective Area 1	3.0	Elective Area 1	3.0
Elective Area 1	3.0	Elective Area 2	3.0	Elective Area 2	6.0
	6		**6**		**9**

Total Credits 45

Computer Science MSCS

Major: Computer Science
Degree Awarded: Master of Science in Computer Science (MSCS)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: Available for full-time, on-campus master's-level students
Classification of Instructional Programs (CIP) code: 11.0701
Standard Occupational Classification (SOC) code: 11-3021; 15-1111; 15-1131; 15-1132; 15-1199

About the Program

The Department of Computer Science in the College of Computing & Informatics (https://drexel.edu/cci/) houses research groups actively conducting research on a wide range of topics in Computer Science including artificial intelligence, machine learning, algorithms, theory, computer vision and graphics, programming languages, networks, privacy and security, high-performance computing, software engineering, and computer algebra. The department emphasizes both interdisciplinary and applied research and is supported by major federal research grants from the National Science Foundation, Department of Defense, Department of Energy and the National Institute of Standards and Technology, as well as by private sources.

The Master of Science in Computer Science program is designed to provide breadth of understanding in the core topics of computer science, in-depth advanced material, and a range of topics in the research areas of the faculty. A balance of theory and practice is presented, preparing students to perform cutting-edge research, as well as training students to become practicing computer scientists or software engineers in business, industry, or government. A thesis option is available to prepare students for doctoral studies or other research-oriented career paths.

The program provides room for electives outside of Computer Science in an area which the student wishes to apply their computing skills and from the Post-Baccalaureate Certificate in Computer Science Foundations (p. 54) (for those with an insufficient Computer Science background).

A graduate co-op is available; for more information, visit the Steinbright Career Development Center's website (http://www.drexel.edu/scdc/co-op/graduate/).

Additional Information

For more information about the Master of Science in Computer Science degree program, including admission requirements, visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-computer-science/).

Master of Science in Computer Science

Students must complete a minimum of 45.0 graduate credits for the MS degree.

Core Courses		**15.0**
Choose 1 course from each category		
Theory		
CS 521	Data Structures and Algorithms I	
CS 525	Theory of Computation	
Computer Systems		
CS 543	Operating Systems	
CS 544	Computer Networks	
Intelligent Systems		
CS 510	Introduction to Artificial Intelligence	
CS 613	Machine Learning	
Programming Systems		
CS 550	Programming Languages	
SE 575	Software Design	
Applications		
CS 500	Fundamentals of Databases	
CS 523	Cryptography	
CS 530	Developing User Interfaces	
CS 536	Computer Graphics	
CS 540	High Performance Computing	
CS 558	Game Engine Programming	
CS 567	Applied Symbolic Computation	
CS 583	Introduction to Computer Vision	
CS 590	Privacy	
SE 578	Security Engineering	
Major Specific Electives		**18.0**
Choose 6 additional graduate-level CS and/or SE courses, except CS 501, CS 502, CS 503, CS 504.		
May include 6 credits of thesis coursework.		
Flexible Electives		**12.0**
Choose 4 additional courses, which may include:		
Any graduate-level courses within CCI (CI, CS, CT, DSCI, INFO, SE)		
Up to 6 credits of independent study (CS I599, CS I699, CS I799, CS I899, CS I999, and CS 997)		
Up to 6 credits of thesis coursework (CS 898)		
Up to 6 credits of related graduate-level coursework outside of CCI, with prior approval by the College		
Optional Coop Experience *		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students	
Total Credits		**45.0-46.0**

*

Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete: COOP 500. The total credits required for this degree with the co-op experience is 46.0

Students not participating in the co-op experience will need 45.0 credits to graduate.

Sample Plan of Study (MSCS)

Part-Time, no co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Core Courses	6.0	Core Courses	6.0	Core Course	3.0	Major Electives	6.0
				Major Elective	3.0		
	6		**6**		**6**		**6**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Major Electives	6.0	Major Elective	3.0	Flexible Electives	6.0	Flexible Elective	3.0
		Flexible Elective	3.0				
	6		**6**		**6**		**3**

Total Credits 45

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Full-Time, with co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
COOP 500	1.0	Core Courses	6.0	Major Electives	9.0	Major Electives	6.0
Core Courses	9.0	Major Elective	3.0			Flexible Electives	3.0
	10		**9**		**9**		**9**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
COOP EXPERIENCE		COOP EXPERIENCE		Flexible Electives	9.0
	0		**0**		**9**

Total Credits 46

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Dual Degree Opportunities

Graduate students already enrolled in a master's degree program at Drexel have the opportunity, through the dual master's program, to work simultaneously on two CCI master's degrees and to receive both upon graduation. To be eligible, graduate students must be currently working on their first CCI master's degree when requesting admission to the second CCI master's degree. They must obtain approval from the graduate advisors of both programs and work out a plan of study encompassing coursework and/or research (thesis) credits for both degrees.

Some courses may be used to satisfy requirements in both degrees, reducing the total number of courses taken, according to Drexel's Dual MS Degree Policy. The dual degree for MSCS students is only available to on-campus students. Please contact your advisor (https://drexel.edu/cci/current-students/graduate-professional-development/advising/) for more information on program requirements as some CCI master's degree combinations may require additional prerequisites.

The dual master's student must complete the Change of Curriculum and Status form (https://drexel.edu/graduatecollege/forms-policies/forms/) and obtain approvals from both graduate advisors. Final approval is granted by the Graduate College (http://drexel.edu/graduatecollege/). The student is then registered in both majors simultaneously. Upon graduation, the student must file two Application for Degree (https://drexel.edu/registrar/graduation/applying-for-degree/) forms.

3675 Market Street

The College of Computing & Informatics is located at 3675 Market (https://drexel.edu/cci/about/our-facilities/). Occupying three floors in the modern uCity Square building, CCI's home offers state-of-the-art technology in our classrooms, research labs, offices, meeting areas and collaboration spaces. 3675 Market offers Class A laboratory, office, coworking, and convening spaces. Located at the intersection of Market Street and 37th Street, 3675 Market acts as a physical nexus, bridging academic campuses and medical centers to the east and south, the commercial corridors along Market Street and Chestnut Street, and the residential communities to the north and west.

The uCity Square building offers:

- Speculative lab/office space
- World-class facilities operated by CIC (https://cic.us/philadelphia/)

- Café/restaurant on-site
- Quorum, a two-story, 15K SF convening space and conference center
- Adjacent to future public square
- Access to Science Center’s nationally renowned business acceleration and technology commercialization programs

Drexel University Libraries

The Drexel University Libraries (https://www.library.drexel.edu/) is a one-stop resource for all members of the Drexel community, providing access to millions of print and online books, journals, databases and other media, as well as hundreds of online course and research guides (https://libguides.library.drexel.edu/libraryguides/), workshops (https://www.library.drexel.edu/news-and-events/events/), and tutorials (https://libguides.library.drexel.edu/tutorials/). Expert librarians offer a variety of consultation services (https://www.library.drexel.edu/research-support/librarians-subject/) virtually or in person, including help with course-related projects, strategies for finding and evaluating authoritative information, and approaches to utilizing, organizing, and presenting scholarship.

Students in the College of Computing & Informatics also have access to the W. W. Hagerty Library (https://www.library.drexel.edu/about/locations/) where they can take advantage of the Libraries’ various learning environments (https://www.library.drexel.edu/services/reserve-room/), including group study rooms, collaborative and silent study areas, and 24/7 study space in the Dragons’ Learning Den. The Libraries also offers a wellness room (https://www.library.drexel.edu/news-and-events/programs-and-initiatives/Wellness-Room/), printing and scanning services (https://www.library.drexel.edu/services/printing-scanning-computing/), and laptops, portable power chargers, (https://www.library.drexel.edu/services/printing-scanning-computing/equipment-loan/) and other equipment you can borrow for use in the Library.

CCI Commons

Located on the 10th floor of 3675 Market Street, the CCI Commons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing, and more collaborative space for its students. Students have access to 3675 Market's fully equipped conference room with 42” displays and videoconferencing capabilities. The CCI Commons provides technical support to students, faculty, and professional staff. In addition, the staff provides audio-visual support for all presentation classrooms within 3675 Market. Use of the CCI Commons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library-related resources may be accessed at the CCI Commons and through the W.W. Hagerty Library. The College is a member of the "Azure Dev Tools for Teaching” platform that allows students free access to a wide array of Microsoft software titles and operating systems.

The CCI Commons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University’s network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

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Computer Science PhD

Major: Computer Science
Degree Awarded: Doctor of Philosophy (PhD)
Calendar Type: Quarter
Minimum Required Credits: 90.0 (post-bachelor's) or 45.0 (post-master's)
Co-op Option: None
Classification of Instructional Programs (CIP) code: 11.0701
Standard Occupational Classification (SOC) code: 11-3021; 15-1111; 15-1131; 15-1132; 15-1199

About the Program

Students enrolled in the PhD in Computer Science program are expected to become an expert in a research area in computer science or a related interdisciplinary field. They are expected to conduct research in considerable depth and make substantial contributions through creative developments and serious scholarship. The program is designed for students to ensure core knowledge of the fundamental computer science areas and to conduct cutting-edge research at the forefront of a selected area. Students are prepared for computer science leadership careers in industry, research, government and education and for interdisciplinary work using computer science.

Additional Information

For more information about these programs, including admission requirements, visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/doctoral-programs/phd-computer-science/).

Degree Requirements

Students in the PhD program move through several milestones on their way to completion of the degree: (1) qualifying requirements in which the student takes courses to ensure breadth and depth of knowledge across areas of computer science; (2) a candidacy exam in which the student performs an in-depth study of a particular area of research; (3) a thesis proposal in which the student provides a detailed overview of their planned dissertation work; and finally (4) a thesis defense in which the student presents their completed dissertation work. Upon entering the PhD program, students work with a Graduate Advisor to develop a plan of study (filed no later than the end of the first term); this plan can be revised and brought up-to-date when necessary, and serves as a blueprint for planning out the timely and successful completion of all milestones.

PhD Students Admitted with Post-Masters Status: Students entering with a master's degree in computer science or a closely related field will be considered a postmasters PhD student and will only be required to complete a total of 45.0 credit hours, in accordance with University policy. Students who are admitted for PhD study with "post-masters" status must take 12.0 credits of graduate coursework and pass each of these courses with a grade of B+ or higher to fulfill the qualifying requirements. Courses are to be chosen in consultation with the Graduate Studies Committee. A post-masters PhD student must meet all other degree milestones (candidacy exam, thesis proposal and thesis defense).

Post-Bachelor's Student Requirements

Breadth Requirements	**12.0**
Students must take 4 courses from the list below, with at least 1 course from each category.	

Theory		
CS 521	Data Structures and Algorithms I	
CS 525	Theory of Computation	
Systems		
CS 543	Operating Systems	
CS 544	Computer Networks	
CS 550	Programming Languages	
SE 575	Software Design	
Applications		
CS 500	Fundamentals of Databases	
CS 510	Introduction to Artificial Intelligence	
CS 523	Cryptography	
CS 530	Developing User Interfaces	
CS 536	Computer Graphics	
CS 540	High Performance Computing	
CS 558	Game Engine Programming	
CS 567	Applied Symbolic Computation	
CS 583	Introduction to Computer Vision	
CS 590	Privacy	
CS 613	Machine Learning	
SE 578	Security Engineering	
Depth Requirement		**12.0**
Students must take 4 additional Computer Science (CS) courses at the 500 level or higher. Related courses (e.g., Software Engineering) may be used to fulfill these requirements with departmental permission. CS 501, CS 502, CS 503, CS 504 and CS 570 cannot be taken to fulfill the Depth Requirement.		
Research		**66.0-111.0**
CS I999	Independent Study in Computer Science	
CS 997	Research in Computer Science	
CS 998	Ph.D. Dissertation	
Total Credits		**90.0-135.0**

Post-Master's Student Requirements

Required Courses		**12.0**
Students must take 4 Depth courses at the 500 level or higher. Specific courses are selected in consultation with the student's advisor and department.		
Research		
CS I999	Independent Study in Computer Science	6.0
CS 997	Research in Computer Science	21.0
CS 998	Ph.D. Dissertation	6.0
Total Credits		**45.0**

All post-bachelors PhD students must take 4 courses as part of the Breadth Requirements, and an additional 4 courses as part of the Depth Requirements. Students must pass each of the 4 Breadth courses with a grade of B+ or higher and must achieve a GPA of 3.5 or higher across all 8 courses. Normally, a student will satisfy the Breadth Requirements by the end of their first year in the program and will satisfy the Depth Requirements by the end of their second year.

- If a student fails to meet the minimum grade or GPA requirements above, the department will require supplemental remediation on a case-by-case basis that may include any of the following: (1) take another Breadth course in the same category and obtain a grade of B+ or higher; (2) retake the same course at the next offering and obtain a grade of B+ or higher; or (3) retake the final exam of the same course with permission of the instructor and obtain a grade of B+ or higher. Failure to satisfy the required remediation will lead to termination from the PhD program.

- If a student feels that they have already mastered the material in any of the Breadth categories (Theory, Systems, or Applications) — for example, from prior coursework or work experience —they may choose to satisfy the requirement in that category by taking an advanced course in the same category, and by receiving a grade of B+ or higher in the advanced course. Students should discuss their situation with the department as early as possible, and the department can provide potential options for advanced courses in that category. In all cases, students must obtain departmental approval before enrolling in or starting any advanced course that will be used to satisfy the Breadth Requirements.

- Transfer credits may not be used for Breadth Requirements but may be used for Depth Requirements. (If transfer credits are used, the GPA for purposes of qualifying is calculated only from Breadth and Depth courses taken while enrolled in the PhD program.) Thus, incoming students with prior graduate-level coursework may be able to transfer up to 4 prior courses into the PhD program to satisfy the Depth Requirements. However, because transfer credits cannot be used for Breadth Requirements, all students must take a minimum of 4 courses as part of the PhD program, regardless of prior coursework.

Sample Plan of Study

Post-Bachelors PhD Student

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
CS 510	3.0	CS 543	3.0	CS 583	3.0	VACATION	
CS 521	3.0	CS 997	6.0	CS 997	6.0		
CS 997	3.0						
	9		**9**		**9**		**0**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
CS 536	3.0	CS 615	3.0	CS 645	3.0	VACATION	
CS 613	3.0	CS 997	3.0	CS 997	3.0		
CS 997	3.0	CS I999 (Candidacy exam prep)	3.0	CS I999 (Candidacy exam prep)	3.0		
	9		**9**		**9**		**0**

Third Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
CS 997	9.0	CS 997	9.0	CS 997	6.0	VACATION	
				CS 998	3.0		
	9		**9**		**9**		**0**

Fourth Year

Fall	Credits
CS 997	6.0
CS 998	3.0
	9

Total Credits 90

Post-Masters PhD Student

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
CS 997	3.0	CS 997	3.0	CS 997	3.0	Vacation	
Depth Courses	6.0	CS I999 (Candidacy exam prep)	3.0	CS I999 (Candidacy exam prep)	3.0		
		Depth Course	3.0	Depth Course	3.0		
	9		**9**		**9**		**0**

Second Year

Fall	Credits	Winter	Credits
CS 997	6.0	CS 997	6.0
CS 998	3.0	CS 998	3.0
	9		**9**

Total Credits 45

Facilities

3675 Market Street

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The uCity Square building offers:

- Speculative lab/office space
- World-class facilities operated by CIC (https://cic.us/philadelphia/)
- Café/restaurant on-site
- Quorum, a two-story, 15K SF convening space and conference center

- Adjacent to future public square
- Access to Science Center's nationally renowned business acceleration and technology commercialization programs

Drexel University Libraries

The Drexel University Libraries (https://www.library.drexel.edu/) is a one-stop resource for all members of the Drexel community, providing access to millions of print and online books, journals, databases and other media, as well as hundreds of online course and research guides (https://libguides.library.drexel.edu/libraryguides/), workshops (https://www.library.drexel.edu/news-and-events/events/), and tutorials (https://libguides.library.drexel.edu/tutorials/). Expert librarians offer a variety of consultation services (https://www.library.drexel.edu/research-support/librarians-subject/) virtually or in person, including help with course-related projects, strategies for finding and evaluating authoritative information, and approaches to utilizing, organizing, and presenting scholarship.

Students in the College of Computing & Informatics also have access to the W. W. Hagerty Library (https://www.library.drexel.edu/about/locations/) where they can take advantage of the Libraries' various learning environments (https://www.library.drexel.edu/services/reserve-room/), including group study rooms, collaborative and silent study areas, and 24/7 study space in the Dragons' Learning Den. The Libraries also offers a wellness room (https://www.library.drexel.edu/news-and-events/programs-and-initiatives/Wellness-Room/), printing and scanning services (https://www.library.drexel.edu/services/printing-scanning-computing/), and laptops, portable power chargers, (https://www.library.drexel.edu/services/printing-scanning-computing/equipment-loan/) and other equipment you can borrow for use in the Library.

CCI Commons

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The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library-related resources may be accessed at the CCI Commons and through the W.W. Hagerty Library. The College is a member of the "Azure Dev Tools for Teaching" platform that allows students free access to a wide array of Microsoft software titles and operating systems.

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Computer Support for Teaching

The CCI server room houses a multitude of servers to support faculty research, staff operations, and student learning. Services provided include a Linux compute cluster which is open to all faculty, staff, and students, multiple virtualization environments to meet different needs of faculty, staff, and students, and other single-purpose servers to support various operations throughout the college. The compute cluster provides a common environment for students to develop software, which makes testing easier for the TAs and faculty. Our virtualization environments allow college members the flexibility of a cloud environment with local support and direct cost recovery options. For those who need dedicated hardware, we also support dedicated research systems.

Classrooms are outfitted with laser projectors, 4K displays, class capture hardware, and the Wolfvision Cynap. The Cynap controls the AV distribution throughout the room and can display up to 4 streams simultaneously. These include the local PC, a laptop connected directly to the podium, or up to 4 streaming devices. Windows, macOS, iOS and Android devices can all connect wirelessly to the presentation system, allowing collaboration and freedom to roam the classroom for better interactivity. Wireless networking and outlets are also available for students throughout the classrooms. Laptops are available for checkout from the CCI Commons desk.

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CCI continues to invest in these virtual environments, and explores emerging environments, to continue to best support CCI research and teaching. CPU cores, storage, and memory are added at every opportunity to these flexible, scalable environments. The current capacity of the system includes:

- 1760 CPU Cores
- 6 TB of Memory

- Over 556 TB of HDD-backed storage
- 122 TB of high-performance SSD-backed storage
- 12 GPUs with room for expansion through funded research for high-performance computing needs

CCI Learning Center

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The CLC and CCI Commons serve as a central hub for small group work, student meetings, and TA assistance.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, in 3675 Market Street including: the Metadata Research Center (MRC), Interactive Systems for Healthcare (IS4H) Research, Economics and Computation (EconCS), The TeX-Base Lab, SPiking And Recurrent SoftwarE (SPARSE) Coding, Human-System Evaluation and Analysis Lab (H-SEAL), Applied Symbolic Computation Laboratory (ASYM), Security and Privacy Analytics Lab (SePAL), Software Engineering and Analytics Research (SOAR), Software Engineering Research Group (SERG), Social Computing Research Group, Vision and Cognition Laboratory (VisCog). For more information on these laboratories, please visit the College's research web page (https://drexel.edu/cci/research/overview/).

Computer Security and Privacy MSCSP

Major: Computer Security and Privacy
Degree Awarded: Master of Science in Computer Security and Privacy (MSCSP)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: Available for full-time, on-campus master's-level students
Classification of Instructional Programs (CIP) code: 11.1003
Standard Occupational Classification (SOC) code: 11-3021; 15-1212; 15-1231; 15-1241; 15-1242; 15-1243; 15-1244

About the Program

Information technology and data have dominated physical, economic, health, and cultural aspects of the modern world. For example, information technology and data run electronic commerce and global finance; control critical infrastructure that supply water, electrical power and food; and comprise the Internet of Things, which range from smartphones to home appliances and to medical implanted devices.

The great advantages that information technology and data bring are, unfortunately, susceptible to malicious actors, ranging from amateur hackers to hostile nation states, who try to circumvent the mechanisms and policies that are designed to protect computers and data. Stories involving malware, such as ransomware and botnets, infecting government, corporate, critical infrastructure, small businesses and even home networks are now common news.

The MS in Computer Security and Privacy aims to educate students in the science, technology, and policies that are essential to protecting information technology and data. The degree aims to establish the computer science and software engineering system fundamentals needed by the modern security expert, in addition to how these fundamentals, when combined with expert courses in computer security and privacy, lead to a well-rounded education in the domain of computer security and privacy.

A graduate co-op is available; for more information, visit the Steinbright Career Development Center's website (https://drexel.edu/scdc/co-op/graduate/).

Admissions Requirements

The Master of Science in Computer Security and Privacy accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-computer-security-and-privacy/) for more information on admission requirements.

Additional Information

For more information about the Master of Science in Computer Security and Privacy degree program, visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-computer-security-and-privacy/).

Admission Requirements

The Master of Science in Computer Security and Privacy accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-computer-security-and-privacy/) for more information on admission requirements.

Degree Requirements

Core Courses		
CS 523	Cryptography	3.0
CS 543	Operating Systems	3.0
CS 544	Computer Networks	3.0
CS 590	Privacy	3.0
CS 645	Network Security	3.0
SE 578	Security Engineering	3.0
Major Specific Electives		**15.0**
Choose 5 of the following:		
CS 510	Introduction to Artificial Intelligence	
CS 613	Machine Learning	
CS 615	Deep Learning	
CS 647	Distributed Systems Software	
CS 660	Data Analysis at Scale	
CT 605	Cloud Security and Virtual Environments	
CT 620	Security, Policy and Governance	
INFO 517	Principles of Cybersecurity	
INFO 710	Information Forensics	
SE 575	Software Design	
SE 576	Software Reliability and Testing	
SE 577	Software Architecture	
Flexible Electives		**12.0**
Choose 4 additional courses, which may include:		
Any graduate-level course within the College (CI, CS, CT, DSCI, INFO, SE)		
Up to 6 credits of independent study		
Up to 6 credits of related graduate-level coursework outside of the College, with prior approval by the College		
Optional Coop Experience *		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students	
Total Credits		**45.0-46.0**

*

Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete: COOP 500.
The total credits required for this degree with the co-op experience is 46.0.
Students not participating in the co-op experience will need 45.0 credits to graduate.

Sample Plan of Study

Part Time, No Co-op option

First Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
Core Courses	6.0 Core Courses	6.0 Core Courses	6.0 Major Specific Electives	6.0
	6	**6**	**6**	**6**
Second Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
Major Specific Electives	6.0 Major Specific Elective	3.0 Flexible Electives	6.0 Flexible Elective	3.0
	Flexible Elective	3.0		
	6	**6**	**6**	**3**
Total Credits 45				

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Full-time, Graduate Co-op option

First Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
COOP 500	1.0 Core Courses	6.0 Core Courses	6.0 Major Specific Electives	6.0
Core Courses	6.0 Major Specific Elective	3.0 Major Specific Elective	3.0 Flexible Elective	3.0
Major Specific Elective	3.0			
	10	**9**	**9**	**9**

Second Year					
Fall	**Credits**	**Winter**	**Credits**	**Spring**	**Credits**
COOP EXPERIENCE		COOP EXPERIENCE		Flexible Electives	9.0
	0		**0**		**9**

Total Credits 46

Data Science MSDS

Major: Data Science
Degree Awarded: Master of Science in Data Science (MSDS)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: Graduate Co-op
Classification of Instructional Programs (CIP) code: 30.7001
Standard Occupational Classification (SOC) code: 15-1111

About the Program

The Master of Science in Data Science program provides a strong foundation in the emerging area of data science with foci on data management and accountability, visualization and communication, and computational, algorithmic, and applied processing techniques. Students gain competency in fundamental methods and techniques for data collection, management, analysis, and result interpretation. Their fundamental understanding and skills will be applied to real-world data analysis tasks through state-of-the-art technologies, tools, and platforms.

A graduate co-op is available; for more information, visit the Steinbright Career Development Center's website (https://drexel.edu/scdc/co-op/graduate/).

Admission Requirements

The Master of Science in Data Science accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-data-science/) for more information on admission requirements.

Additional Information

For more information, please visit the College of Computing & Informatics (CCI) website (https://drexel.edu/cci/academics/masters-programs/ms-in-data-science/).

Degree Requirements

Required Certificates		
Data Science Foundations		
DSCI 511	Data Acquisition and Pre-Processing	3.0
DSCI 521	Data Analysis and Interpretation	3.0
Choose 2 courses from the following:		6.0
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	
CS 504	Introduction to Software Design	
DSCI 501	Quantitative Foundations of Data Science	
INFO 590	Foundations of Data and Information	
INFO 605	Database Management Systems	
INFO 620	Information Systems Analysis and Design	
INFO 633	Information Visualization	
INFO 659	Introduction to Data Analytics	
INFO 725	Information Policy and Ethics	
Machine Learning for Data Science		
DSCI 631	Applied Machine Learning for Data Science	3.0
DSCI 641	Recommender Systems for Data Science	3.0
Choose 2 of the following:		6.0
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 583	Introduction to Computer Vision	
CS 613	Machine Learning	

CS 614	Applications of Machine Learning	
CS 615	Deep Learning	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 521	Data Analysis and Interpretation	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 623	Social Network Analytics	
Required Core Course		
DSCI 632	Applied Cloud Computing	3.0
Required Capstone Courses		
DSCI 591	Data Science Capstone I	3.0
DSCI 592	Data Science Capstone II	3.0
Electives or Optional Third Certificate		**12.0**
Students can choose any combination of any courses listed below for a total of 45.0 credits (12.0 credits beyond the required 33.0 credits). If a student chooses all courses listed in a single area, they may apply for a graduate certificate in that area. A degree student may receive a maximum of three certificates.		
Students can apply for a third (optional) certificate such as Big Data Analytics PBC, HCI/UX Research and Design PBC, and Applied AI/ML PBC.		
A course cannot be used to satisfy multiple parts of the degree requirements.		
Big Data Analytics (optional 3rd certificate)		
DSCI 632	Applied Cloud Computing	
INFO 623	Social Network Analytics	
Choose 2 of the following:		
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 540	High Performance Computing	
CS 615	Deep Learning	
CS 647	Distributed Systems Software	
CS 660	Data Analysis at Scale	
CT 500	Introduction to the Digital Environment	
CT 600	Cloud Technology	
CT 605	Cloud Security and Virtual Environments	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 521	Data Analysis and Interpretation	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 605	Database Management Systems	
INFO 607	Applied Database Technologies	
Applied AI/ML (optional 3rd certificate)		
CS 501	Introduction to Programming	
or CS 570	Programming Foundations	
CS 614	Applications of Machine Learning	
INFO 629	Applied Artificial Intelligence	
Choose 1 of the following:		
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 511	Data Acquisition and Pre-Processing	
DSCI 521	Data Analysis and Interpretation	
DSCI 631	Applied Machine Learning for Data Science	
INFO 612	Knowledge-based Systems	
INFO 692	Explainable Artificial Intelligence	
INFO 693	Human–Artificial Intelligence Interaction	
HCI/UX Research and Design (optional 3rd certificate)		
INFO 508	Information Innovation through Design Thinking	
or DSRE 620	Design Problem Solving	
INFO 615	Designing with Data	
INFO 690	Understanding Users: User Experience Research Methods	
INFO 691	Prototyping the User Experience	
Additional appropriate graduate level (500-899) Data Science (DSCI), Information Systems (INFO), Computer Science (CS), Software Engineering (SE), or Artificial Intelligence, consulting with your advisor.		
Optional Coop Experience *		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students	
Total Credits		**45.0-46.0**

*

Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete COOP 500.
The total credits required for this degree with the co-op experience is 46.0
Students not participating in the co-op experience will need 45.0 credits to graduate.

Sample Plan of Study

Part-time, no co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
CS 570	3.0	DSCI 521	3.0	DSCI 631	3.0	Vacation	
DSCI 511	3.0	DS Foundations Elective	3.0	Certificate Course or Elective	3.0		
	6		**6**		**6**		**0**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Machine Learning for DS Elective	3.0	DSCI 632	3.0	Machine Learning for DS Elective	3.0	Vacation	
Certificate Course or Elective	3.0	DS Foundation Elective	3.0	Certificate Course or Elective	3.0		
	6		**6**		**6**		**0**

Third Year

Fall	Credits	Winter	Credits
DSCI 591	3.0	DSCI 592	3.0
Certificate Course or Elective	3.0		
	6		**3**

Total Credits 45

Note: Third Year Winter is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term

Full-time with co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
COOP 500	1.0	DSCI 521	3.0	DSCI 631	3.0	DSCI 632	3.0
CS 570	3.0	DS Foundations Elective	3.0	Certificate Courses or Electives	6.0	DSCI 591	3.0
DSCI 511	3.0	Machine Learning for DS Elective	3.0			Certificate Course or Elective	3.0
DS Foundations Elective	3.0						
	10		**9**		**9**		**9**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
COOP EXPERIENCE		COOP EXPERIENCE		DSCI 592	3.0
				Machine Learning for DS Elective	3.0
				Certificate Course or Elective	3.0
	0		**0**		**9**

Total Credits 46

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Facilities

3675 Market Street

The College of Computing & Informatics is located at 3675 Market (https://drexel.edu/cci/about/our-facilities/). Occupying three floors in the modern uCity Square building, CCI's home offers state-of-the-art technology in our classrooms, research labs, offices, meeting areas and collaboration spaces. 3675 Market offers Class A laboratory, office, coworking, and convening spaces. Located at the intersection of Market Street and 37th Street, 3675 Market

acts as a physical nexus, bridging academic campuses and medical centers to the east and south, the commercial corridors along Market Street and Chestnut Street, and the residential communities to the north and west.

The uCity Square building offers:

- Speculative lab/office space
- World-class facilities operated by CIC (https://cic.us/philadelphia/)
- Café/restaurant on-site
- Quorum, a two-story, 15K SF convening space and conference center
- Adjacent to future public square
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Human-Computer Interaction and User Experience MSHCIU

Major: Human-Computer Interaction and User Experience
Degree Awarded: Master of Science in Human-Computer Interaction/User Experience (MSHCIU)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: Optional for full-time, on-campus master's-level students
Classification of Instructional Programs (CIP) code: 30.3101
Standard Occupational Classification (SOC) code: 15-1210

About the Program

The Master of Science in Human-Computer Interaction and User Experience (HCI/UX) explores creative ideas, theories, and technologies to advance students' understanding of the complex and tightly coupled relationships between people and computing systems. The program prepares students to create and evaluate technologies that support and complement human needs and abilities in a broad range of contexts such as work, wellness, home, entertainment, and artistic expression. The HCI/UX program prepares students for a range of careers related to user experience research and design, interface design, and software development.

A graduate co-op is available; for more information, visit the Steinbright Career Development Center's website (https://drexel.edu/scdc/co-op/graduate/).

Admission Requirements

The Master of Science in Human-Computer Interaction and User Experience accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-information-human-computer-interaction-ux/) for more information on admission requirements.

Additional Information

For more information about this master's program, visit the College of Computing & Informatics HCI/UX webpage (https://drexel.edu/cci/academics/masters-programs/ms-in-information-human-computer-interaction-ux/).

Admission Requirements

The Master of Science in Information accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-information-human-computer-interaction-ux/) for more information on admission requirements.

Degree Requirements

HCI/UX Research and Design		
INFO 508	Information Innovation through Design Thinking	3.0
or DSRE 620	Design Problem Solving	
INFO 615	Designing with Data	3.0
INFO 690	Understanding Users: User Experience Research Methods	3.0
INFO 691	Prototyping the User Experience	3.0
HCI/UX Theory and Frontiers		
INFO 608	Human-Computer Interaction	3.0
INFO 609	Accessible and Inclusive Design	3.0
INFO 616	Social and Collaborative Computing	3.0
INFO 693	Human–Artificial Intelligence Interaction	3.0
Elective Courses *		**15.0**
Capstone		
INFO 881	HCI/UX Capstone I	3.0
INFO 882	HCI/UX Capstone II	3.0
Optional Co-op Experience **		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students **	
Total Credits		**45.0-46.0**

*****

Students can choose any combination of any courses listed below for a total of 45.0 credits (15.0 credits beyond the required 30.0 credits). If a student chooses all courses listed in a single area, they may apply for a graduate certificate in that area. A degree student may receive a maximum of three certificates.

******

Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete: COOP 500

Web Application Development		
Introduces students to web and mobile application design and development		
INFO 532	Software Development	3.0
INFO 600	Web Systems & Architecture	3.0
INFO 655	Intro to Web Programming	3.0
Choose 2 (two) of the following:		6.0
INFO 670	Cross-platform Mobile Development	
SE 627	Requirements Engineering and Management	
SE 638	Software Project Management	
Total Credits		**15.0**

Data Science Foundations		
Provides a foundation for managing and leveraging data assets to support decision making, problem solving, modeling and related activities.		
DSCI 511	Data Acquisition and Pre-Processing	3.0
DSCI 521	Data Analysis and Interpretation	3.0
Choose 3 courses from:		9.0
CS 570	Programming Foundations	
CS 590	Privacy	
DSCI 501	Quantitative Foundations of Data Science	
INFO 590	Foundations of Data and Information	
INFO 623	Social Network Analytics	
INFO 633	Information Visualization	
INFO 648	Healthcare Informatics	
INFO 725	Information Policy and Ethics	
Total Credits		**15.0**

Applied Artificial Intelligence and Machine Learning		
Introduces students to data analysis and interpretation, machine learning, artificial intelligence, and deep learning.		

CS 501	Introduction to Programming	3.0
or CS 570	Programming Foundations	
CS 614	Applications of Machine Learning	3.0
INFO 629	Applied Artificial Intelligence	3.0
Choose one of the following:		3.0
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 511	Data Acquisition and Pre-Processing	
DSCI 521	Data Analysis and Interpretation	
DSCI 631	Applied Machine Learning for Data Science	
INFO 612	Knowledge-based Systems	
INFO 692	Explainable Artificial Intelligence	
INFO 693	Human–Artificial Intelligence Interaction	
Total Credits		**12.0**

Computer Science Foundations

Introduces students without prior programming experience to the theoretical and technical foundations necessary to tackle the latest challenges in computer science and related areas.		
CS 501	Introduction to Programming	3.0
CS 502	Data Structures and Algorithms	3.0
CS 503	Systems Basics	3.0
CS 504	Introduction to Software Design	3.0
Total Credits		**12.0**

Additional Elective Courses

DIGM 501	New Media: History, Theory and Methods	3.0
AS-I 501	Creative Interdisciplinary Team Research: Principles and Practice	3.0
INFO 509	Information & Social Justice	3.0
INFO 540	Perspectives on Information Systems	3.0
INFO 590	Foundations of Data and Information	3.0
INFO 623	Social Network Analytics	3.0
INFO 633	Information Visualization	3.0
INFO 659	Introduction to Data Analytics	3.0
INFO 682	Storytelling	3.0
INFO 725	Information Policy and Ethics	3.0
MKTG 601	Marketing Strategy & Planning	3.0

Sample Plan of Study

Graduate, Part-time, No Co-op Option

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
INFO 508	3.0	INFO 690	3.0	INFO 615	3.0	INFO 609	3.0
INFO 608	3.0	INFO 616	3.0	INFO 691	3.0	Elective	3.0
	6		**6**		**6**		**6**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
INFO 693	3.0	Electives	6.0	INFO 881	3.0	INFO 882	3.0
Elective	3.0			Elective	3.0		
	6		**6**		**6**		**3**

Total Credits 45

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Graduate, Full-time, Co-op Option

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
COOP 500	1.0	INFO 690	3.0	INFO 691	3.0	INFO 881	3.0
INFO 508	3.0	INFO 616	3.0	INFO 615	3.0	Electives	6.0
INFO 608	3.0	INFO 609	3.0	Elective	3.0		

INFO 693	3.0						
	10	**9**			**9**		**9**

Second Year

Fall	**Credits**	**Winter**	**Credits**	**Spring**	**Credits**
COOP EXPERIENCE		COOP EXPERIENCE		INFO 882	3.0
				Electives	6.0
	0		**0**		**9**

Total Credits 46

Information Science PhD

Major: Information Science
Degree Awarded: Doctor of Philosophy (PhD)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: None
Classification of Instructional Programs (CIP) code: 11.0401
Standard Occupational Classification (SOC) code: 11-3021

About the Program

The College of Computing & Informatics' on-campus PhD in Information Science program prepares students to become creative, interdisciplinary researchers with foundations in information science, data science, and human-centered computing.

Purpose and Scope

The program is designed to support all students in attaining a high level of scholarly achievement in seminars as well as supervised and independent study. The doctoral program has two major goals: acquisition of in-depth knowledge in a specialized research area, and interdisciplinary breadth to support creative scholarship. The degree prepares students for leadership and research careers in academia, industry, administration, and policy setting.

Opportunities

Most graduates move into academic or research and development (R&D) careers.

Additional Information

A master’s degree is not a prerequisite for the PhD. For more information about this program, please visit the College of Computing & Informatics PhD in Information Science webpage (https://drexel.edu/cci/academics/doctoral-programs/phd-information-science/).

Degree Requirements

Doctor of Philosophy (PhD) candidates must complete a minimum of 90 degree credits. Students entering with a master's degree can use the master’s degree as 45.0 credits towards the total of 90.0 credits, pending faculty advisor approval. Students entering without a master's degree need to complete a combination of course and research credits with faculty advisor approval, towards the total of 90.0 credits.

Post-Bachelor's Student Requirements

Required General Course		
INFO 800	Science of Science	3.0
Required Research Methods Courses		
INFO 813	Quantitative Research Methods	3.0
INFO 816	Qualitative Research Methods	3.0
Required Foundation Courses		**6.0**
Complete 2 of the following:		
INFO 821	Foundations in Information Science	
INFO 823	Foundations in Human-Centered Computing	
INFO 825	Foundations in Data Science	
Specialization Courses *		**9.0**
Information Science		
INFO 509	Information & Social Justice	
INFO 517	Principles of Cybersecurity	
INFO 624	Information Retrieval Systems	
INFO 648	Healthcare Informatics	
INFO 662	Metadata and Resource Description	

INFO 725	Information Policy and Ethics	
INFO 732	Healthcare Informatics: Planning & Evaluation	
INFO 750	Archival Access Systems	
INFO 756	Digital Preservation	
Human-Centered Computing		
CS 530	Developing User Interfaces	
CS 630	Cognitive Systems	
INFO 608	Human-Computer Interaction	
INFO 609	Accessible and Inclusive Design	
INFO 616	Social and Collaborative Computing	
INFO 690	Understanding Users: User Experience Research Methods	
INFO 691	Prototyping the User Experience	
INFO 693	Human–Artificial Intelligence Interaction	
Data Science		
CS 521	Data Structures and Algorithms I	
CS 613	Machine Learning	
CS 615	Deep Learning	
CS 660	Data Analysis at Scale	
DSCI 511	Data Acquisition and Pre-Processing	
DSCI 521	Data Analysis and Interpretation	
DSCI 631	Applied Machine Learning for Data Science	
DSCI 632	Applied Cloud Computing	
DSCI 641	Recommender Systems for Data Science	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 607	Applied Database Technologies	
INFO 612	Knowledge-based Systems	
INFO 623	Social Network Analytics	
INFO 629	Applied Artificial Intelligence	
INFO 633	Information Visualization	
INFO 634	Data Mining	
INFO 692	Explainable Artificial Intelligence	
Seminars		
CI 872	Research Seminar	1.0-3.0
INFO 871	PhD Process and Practice	1.0
INFO 873	Special Topics Seminar	1.0-3.0
Research		**63.0-105.0**
INFO 998	Ph.D. Research and Dissertation	
INFO I999	Independent Study in INFO	
Total Credits		**90.0-136.0**

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Students may take courses beyond the list of the specialization courses, including courses from other academic units, with approval from the PhD program director.

Post-Master's Student Requirements

Required General Course		
INFO 800	Science of Science	3.0
Foundations Courses		**6.0**
Complete 2 of the following:		
INFO 821	Foundations in Information Science	
INFO 823	Foundations in Human-Centered Computing	
INFO 825	Foundations in Data Science	
Required Research Methods Courses		
INFO 813	Quantitative Research Methods	3.0
INFO 816	Qualitative Research Methods	3.0
Specialization Courses [*]		**9.0**
Information Science		
INFO 517	Principles of Cybersecurity	
INFO 624	Information Retrieval Systems	
INFO 648	Healthcare Informatics	
INFO 662	Metadata and Resource Description	

INFO 725	Information Policy and Ethics	
INFO 732	Healthcare Informatics: Planning & Evaluation	
INFO 750	Archival Access Systems	
INFO 756	Digital Preservation	
Human-Centered Computing		
CS 530	Developing User Interfaces	
CS 630	Cognitive Systems	
INFO 608	Human-Computer Interaction	
INFO 616	Social and Collaborative Computing	
INFO 690	Understanding Users: User Experience Research Methods	
INFO 691	Prototyping the User Experience	
INFO 693	Human–Artificial Intelligence Interaction	
Data Science		
CS 521	Data Structures and Algorithms I	
CS 613	Machine Learning	
CS 615	Deep Learning	
CS 660	Data Analysis at Scale	
INFO 607	Applied Database Technologies	
INFO 612	Knowledge-based Systems	
INFO 623	Social Network Analytics	
INFO 629	Applied Artificial Intelligence	
INFO 633	Information Visualization	
INFO 634	Data Mining	
INFO 692	Explainable Artificial Intelligence	
Seminars		
CI 872	Research Seminar	1.0
INFO 871	PhD Process and Practice	1.0
INFO 873	Special Topics Seminar	1.0
Research		
INFO 998	Ph.D. Research and Dissertation	18.0
Total Credits		**45.0**

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Students may take courses beyond the list of the specialization courses, including courses from other academic units, with approval from the PhD program director.

Sample Plan of Study

Full-Time with completed Master's Degree (Post-Master's Students)

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
INFO 800	3.0	INFO 998*	3.0	INFO 998*	3.0	VACATION	
INFO 871	1.0	Methods Course	3.0	Methods Course	3.0		
INFO 998*	2.0	Foundation Course	3.0	Specialization Course	3.0		
Foundation Course	3.0						
	9		**9**		**9**		**0**

Second Year

Fall	Credits	Winter	Credits
INFO 873	1.0	CI 872	1.0
INFO 998*	5.0	INFO 998*	5.0
Specialization Course	3.0	Specialization Course	3.0
	9		**9**

Total Credits 45

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Number of credits taken each quarter is variable depending on stage of the project and other credit load. May be taken for additional credits if necessary.

Full-Time without completed Master's Degree (Post-Bachelor's Students)

First Year							
Fall	**Credits**	**Winter**	**Credits**	**Spring**	**Credits**	**Summer**	**Credits**
INFO 871	1.0	Research/Coursework	9.0	Research/Coursework	9.0	VACATION	
Research/Coursework	8.0						
	9		**9**		**9**		**0**
Second Year							
Fall	**Credits**	**Winter**	**Credits**	**Spring**	**Credits**	**Summer**	**Credits**
INFO 800	3.0	INFO 998*	3.0	INFO 998*	6.0	VACATION	
INFO 998*	3.0	Methods Course	3.0	Methods Course	3.0		
Foundation Course	3.0	Foundation Course	3.0				
	9		**9**		**9**		**0**
Third Year							
Fall	**Credits**	**Winter**	**Credits**	**Spring**	**Credits**	**Summer**	**Credits**
INFO 998*	9.0	INFO 998*	9.0	INFO 998*	9.0	VACATION	
	9		**9**		**9**		**0**
Fourth Year							
Fall	**Credits**						
INFO 998*	9.0						
	9						
Total Credits 90							

*

Number of credits taken each quarter is variable depending on stage of the project and other credit load. May be taken for additional credits if necessary.

Facilities

3675 Market Street

The College of Computing & Informatics is located at 3675 Market (https://drexel.edu/cci/about/our-facilities/). Occupying three floors in the modern uCity Square building, CCI's home offers state-of-the-art technology in our classrooms, research labs, offices, meeting areas and collaboration spaces. 3675 Market offers Class A laboratory, office, coworking, and convening spaces. Located at the intersection of Market Street and 37th Street, 3675 Market acts as a physical nexus, bridging academic campuses and medical centers to the east and south, the commercial corridors along Market Street and Chestnut Street, and the residential communities to the north and west.

The uCity Square building offers:

- Speculative lab/office space
- World-class facilities operated by CIC (https://cic.us/philadelphia/)
- Café/restaurant on-site
- Quorum, a two-story, 15K SF convening space and conference center
- Adjacent to future public square
- Access to Science Center’s nationally renowned business acceleration and technology commercialization programs

Drexel University Libraries

The Drexel University Libraries (https://www.library.drexel.edu/) is a one-stop resource for all members of the Drexel community, providing access to millions of print and online books, journals, databases and other media, as well as hundreds of online course and research guides (https://libguides.library.drexel.edu/libraryguides/), workshops (https://www.library.drexel.edu/news-and-events/events/), and tutorials (https://libguides.library.drexel.edu/tutorials/). Expert librarians offer a variety of consultation services (https://www.library.drexel.edu/research-support/librarians-subject/) virtually or in person, including help with course-related projects, strategies for finding and evaluating authoritative information, and approaches to utilizing, organizing, and presenting scholarship.

Students in the College of Computing & Informatics also have access to the W. W. Hagerty Library (https://www.library.drexel.edu/about/locations/) where they can take advantage of the Libraries’ various learning environments (https://www.library.drexel.edu/services/reserve-room/), including group study rooms, collaborative and silent study areas, and 24/7 study space in the Dragons’ Learning Den. The Libraries also offers a wellness room (https://www.library.drexel.edu/news-and-events/programs-and-initiatives/Wellness-Room/), printing and scanning services (https://www.library.drexel.edu/services/printing-scanning-computing/), and laptops, portable power chargers, (https://www.library.drexel.edu/services/printing-scanning-computing/equipment-loan/) and other equipment you can borrow for use in the Library.

CCI Commons

Located on the 10th floor of 3675 Market Street, the CCI Commons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing, and more collaborative space for its students. Students have access to 3675 Market's fully equipped conference room with 42” displays and videoconferencing capabilities. The CCI Commons provides technical support to students, faculty, and professional staff. In addition, the staff provides audio-visual support for all presentation classrooms within 3675 Market. Use of the CCI Commons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library-related resources may be accessed at the CCI Commons and through the W.W. Hagerty Library. The College is a member of the "Azure Dev Tools for Teaching” platform that allows students free access to a wide array of Microsoft software titles and operating systems.

The CCI Commons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University’s network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Computer Support for Teaching

The CCI server room houses a multitude of servers to support faculty research, staff operations, and student learning. Services provided include a Linux compute cluster which is open to all faculty, staff, and students, multiple virtualization environments to meet different needs of faculty, staff, and students, and other single-purpose servers to support various operations throughout the college. The compute cluster provides a common environment for students to develop software, which makes testing easier for the TAs and faculty. Our virtualization environments allow college members the flexibility of a cloud environment with local support and direct cost recovery options. For those who need dedicated hardware, we also support dedicated research systems.

Classrooms are outfitted with laser projectors, 4K displays, class capture hardware, and the Wolfvision Cynap. The Cynap controls the AV distribution throughout the room and can display up to 4 streams simultaneously. These include the local PC, a laptop connected directly to the podium, or up to 4 streaming devices. Windows, macOS, iOS and Android devices can all connect wirelessly to the presentation system, allowing collaboration and freedom to roam the classroom for better interactivity. Wireless networking and outlets are also available for students throughout the classrooms. Laptops are available for checkout from the CCI Commons desk.

Additionally, CCI is hosting and supporting multiple Virtual Computing Lab environments for students to use that mimics the physical computer labs in CCI. This technology allows both online and face to face students to have the same experience when using computing facilities.

CCI Virtual Environments

CCI hosts a variety of virtual environments, which support all levels of research, academics, and administration at CCI. These include OpenStack, Proxmox VE, VMWare, and Xen architectures, backed by storage in CEPH. Multiple environments allow CCI IT to provide researchers with the level of control appropriate for the project at hand and make efficient use of project funding. External cloud vendors such as AWS and Google Cloud Platform are also used when appropriate.

CCI continues to invest in these virtual environments, and explores emerging environments, to continue to best support CCI research and teaching. CPU cores, storage, and memory are added at every opportunity to these flexible, scalable environments. The current capacity of the system includes:

- 1760 CPU Cores
- 6 TB of Memory
- Over 556 TB of HDD-backed storage
- 122 TB of high-performance SSD-backed storage
- 12 GPUs with room for expansion through funded research for high-performance computing needs

CCI Learning Center

The CCI Learning Center (CLC), located in 3675 Market Street's CCI Commons student computer lab, provides consulting and other learning resources for students taking courses offered by the Computer Science Department. The CLC is staffed by graduate and undergraduate computer science students from the College of Computing & Informatics.

The CLC and CCI Commons serve as a central hub for small group work, student meetings, and TA assistance.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, in 3675 Market Street including: the Metadata Research Center (MRC), Interactive Systems for Healthcare (IS4H) Research, Economics and Computation (EconCS), The TeX-Base Lab, SPiking And Recurrent SoftwarE (SPARSE) Coding, Human-System Evaluation and Analysis Lab (H-SEAL), Applied Symbolic Computation Laboratory (ASYM), Security and Privacy Analytics Lab (SePAL), Software Engineering and Analytics Research (SOAR), Software Engineering Research Group (SERG), Social Computing Research Group,

Vision and Cognition Laboratory (VisCog). For more information on these laboratories, please visit the College's research web page (https://drexel.edu/cci/research/overview/).

Information Systems MSIS

Major: Information Systems
Degree Awarded: Master of Science in Information Systems (MSIS)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: Available for full-time, on-campus master's-level students
Classification of Instructional Programs (CIP) code: 11.0401
Standard Occupational Classification (SOC) code: 11-3021

About the Program

The College of Computing & Informatics (https://drexel.edu/cci/)' Master of Science in Information Systems (MSIS) prepares students for both the technical and real-world aspects of developing and managing information systems. The program is offered both online and on campus, part-time and full-time.

The program is designed for students with no prior background in information systems who would like an education in the latest innovative methods in data analysis and information systems, or those with a background in IS development who wish to refresh and update their technical design and analysis skills. Courses integrate the business, organizational, and technical aspects of computer-based information systems, while offering the chance to develop and expand expertise in three specialist areas:

1. Information systems development and management, such as organizational information system design, business systems requirements analysis, software project management, web-based application development and systems implementation

2. Big data management, covering the creation and management of databases, interfaces and information systems that connect users with the information they seek, including areas such as database systems design and management, data mining, natural language processing, intelligent systems, and data analytics

3. Human-centered computing, such as human-computer interaction, user-experience design, social computing, collaboration systems, and online community support

A graduate co-op is available for this program. For more information, visit the Steinbright Career Development Center's website (http://www.drexel.edu/scdc/co-op/graduate/).

Admission Requirements

The Master of Science in Information Systems accepts applicants who hold a Bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-information-systems/) for more information on admission requirements.

Additional Information

For more information about this program, visit the College of Computing & Informatics MS in Information Systems (https://drexel.edu/cci/academics/masters-programs/ms-in-information-systems/) webpage.

Admission Requirements

The Master of Science in Information Systems accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-information-systems/) for more information on admission requirements.

Degree Requirements

Required Courses		
INFO 517	Principles of Cybersecurity	3.0
INFO 540	Perspectives on Information Systems	3.0
INFO 605	Database Management Systems	3.0
INFO 608	Human-Computer Interaction	3.0
INFO 620	Information Systems Analysis and Design	3.0
Focus Area		**12.0-15.0**
Choose 1 Focus Area		
Web Application Development		
INFO 532	Software Development	

INFO 600	Web Systems & Architecture	
INFO 655	Intro to Web Programming	
Choose 2 of the following:		
INFO 670	Cross-platform Mobile Development	
SE 627	Requirements Engineering and Management	
SE 638	Software Project Management	
Data Science Foundations		
DSCI 511	Data Acquisition and Pre-Processing	
DSCI 521	Data Analysis and Interpretation	
Choose 2 of the following:		
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	
CS 504	Introduction to Software Design	
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
DSCI 501	Quantitative Foundations of Data Science	
INFO 590	Foundations of Data and Information	
INFO 605	Database Management Systems	
INFO 620	Information Systems Analysis and Design	
INFO 633	Information Visualization	
INFO 659	Introduction to Data Analytics	
INFO 725	Information Policy and Ethics	
Human-Computer Interaction & User Experience Research and Design		
INFO 508	Information Innovation through Design Thinking	
or DSRE 620	Design Problem Solving	
INFO 690	Understanding Users: User Experience Research Methods	
INFO 691	Prototyping the User Experience	
INFO 615	Designing with Data	
Electives *		**15.0-18.0**
If chosen focus area is less than 15.0 credits, complete an additional 3.0 credit elective.		
CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	
CS 504	Introduction to Software Design	
DSCI 632	Applied Cloud Computing	
INFO 508	Information Innovation through Design Thinking	
INFO 517	Principles of Cybersecurity	
INFO 532	Software Development	
INFO 600	Web Systems & Architecture	
INFO 606	Advanced Database Management	
INFO 607	Applied Database Technologies	
INFO 612	Knowledge-based Systems	
INFO 616	Social and Collaborative Computing	
INFO 623	Social Network Analytics	
INFO 624	Information Retrieval Systems	
INFO 629	Applied Artificial Intelligence	
INFO 633	Information Visualization	
INFO 634	Data Mining	
INFO 646	Information Systems Management	
INFO 648	Healthcare Informatics	
INFO 655	Intro to Web Programming	
INFO 659	Introduction to Data Analytics	
INFO 670	Cross-platform Mobile Development	
INFO 690	Understanding Users: User Experience Research Methods	
INFO 691	Prototyping the User Experience	
INFO 710	Information Forensics	
INFO 712	Information Assurance	
INFO 725	Information Policy and Ethics	
INFO 731	Managing Health Informatics Projects	
INFO 732	Healthcare Informatics: Planning & Evaluation	
INFO 733	Public Health Informatics	
SE 570	Agile Software Development Process	

SE 578	Security Engineering	
SE 610	Open Source Software Engineering	
SE 627	Requirements Engineering and Management	
SE 630	Software Engineering Economics	
SE 638	Software Project Management	
Optional Coop Experience **		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students **	
Total Credits		**45.0-46.0**

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Additional elective choices include

- Another approved CCI certificate
- Appropriate graduate-level courses in CCI (CS, CT, SE, DSCI, INFO) with advisor approval
- Up to 2 appropriate graduate-level computing-related courses outside of CCI approved by the College.

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Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete: COOP 500. The total credits required for this degree with the co-op experience is 46.0.
Students not participating in the co-op experience will need 45.0 credits to graduate.

Sample Plan of Study

Graduate, Part-time, No Co-op Option

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
INFO 517	3.0	INFO 605	3.0	INFO 608	3.0	VACATION	
INFO 540	3.0	Focus Area	3.0	INFO 620	3.0		
	6		**6**		**6**		**0**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Focus Area	6.0	Focus Area	6.0	Electives	6.0	VACATION	
	6		**6**		**6**		**0**

Third Year

Fall	Credits	Winter	Credits
Elective	6.0	Elective	3.0
	6		**3**

Total Credits 45

Note: Third Year Winter is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Graduate, Full-time, Co-op Option

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
COOP 500	1.0	INFO 605	3.0	INFO 608	3.0	Focus Area	3.0
INFO 517	3.0	Focus Area	6.0	INFO 620	3.0	Electives	6.0
INFO 540	3.0			Focus Area	3.0		
Focus Area	3.0						
	10		**9**		**9**		**9**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
COOP EXPERIENCE		COOP EXPERIENCE		Electives	9.0
	0		**0**		**9**

Total Credits 46

Note: Third Year Winter is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Dual Degree Opportunities

Graduate students already enrolled in a master's degree program at Drexel have the opportunity, through the dual master's program to work simultaneously on two master's degrees and to receive both upon graduation. To be eligible, graduate students must be currently working on their

first degree when requesting admission to the second. They must obtain approval from the graduate advisors of both programs and work out a plan of study encompassing coursework and/or research (thesis) credits for both degrees. Please contact your advisor (https://drexel.edu/cci/current-students/graduate-professional-development/advising/) for more information on program requirements as some CCI master's degree combinations may require additional pre-requisites.

The dual master's student must complete the Change of Curriculum and Status form (https://drexel.edu/graduatecollege/forms-policies/forms/) and obtain approvals from both graduate advisors. Final approval is granted by the Graduate College (http://drexel.edu/graduatecollege/). The student is then registered in both majors simultaneously. Upon graduation, the student must file two Application for Degree (https://drexel.edu/registrar/graduation/applying-for-degree/) forms.

Facilities

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- World-class facilities operated by CIC (https://cic.us/philadelphia/)
- Café/restaurant on-site
- Quorum, a two-story, 15K SF convening space and conference center
- Adjacent to future public square
- Access to Science Center’s nationally renowned business acceleration and technology commercialization programs

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CCI Commons

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The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library-related resources may be accessed at the CCI Commons and through the W.W. Hagerty Library. The College is a member of the "Azure Dev Tools for Teaching” platform that allows students free access to a wide array of Microsoft software titles and operating systems.

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Computer Support for Teaching

The CCI server room houses a multitude of servers to support faculty research, staff operations, and student learning. Services provided include a Linux compute cluster which is open to all faculty, staff, and students, multiple virtualization environments to meet different needs of faculty, staff, and students, and other single-purpose servers to support various operations throughout the college. The compute cluster provides a common environment for students to develop software, which makes testing easier for the TAs and faculty. Our virtualization environments allow college members the flexibility of a cloud environment with local support and direct cost recovery options. For those who need dedicated hardware, we also support dedicated research systems.

Classrooms are outfitted with laser projectors, 4K displays, class capture hardware, and the Wolfvision Cynap. The Cynap controls the AV distribution throughout the room and can display up to 4 streams simultaneously. These include the local PC, a laptop connected directly to the podium, or up to 4 streaming devices. Windows, macOS, iOS and Android devices can all connect wirelessly to the presentation system, allowing collaboration and freedom to roam the classroom for better interactivity. Wireless networking and outlets are also available for students throughout the classrooms. Laptops are available for checkout from the CCI Commons desk.

Additionally, CCI is hosting and supporting multiple Virtual Computing Lab environments for students to use that mimics the physical computer labs in CCI. This technology allows both online and face to face students to have the same experience when using computing facilities.

CCI Virtual Environments

CCI hosts a variety of virtual environments, which support all levels of research, academics, and administration at CCI. These include OpenStack, Proxmox VE, VMWare, and Xen architectures, backed by storage in CEPH. Multiple environments allow CCI IT to provide researchers with the level of control appropriate for the project at hand and make efficient use of project funding. External cloud vendors such as AWS and Google Cloud Platform are also used when appropriate.

CCI continues to invest in these virtual environments, and explores emerging environments, to continue to best support CCI research and teaching. CPU cores, storage, and memory are added at every opportunity to these flexible, scalable environments. The current capacity of the system includes:

- 1760 CPU Cores
- 6 TB of Memory
- Over 556 TB of HDD-backed storage
- 122 TB of high-performance SSD-backed storage
- 12 GPUs with room for expansion through funded research for high-performance computing needs

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The CLC and CCI Commons serve as a central hub for small group work, student meetings, and TA assistance.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, in 3675 Market Street including: the Metadata Research Center (MRC), Interactive Systems for Healthcare (IS4H) Research, Economics and Computation (EconCS), The TeX-Base Lab, SPiking And Recurrent SoftwarE (SPARSE) Coding, Human-System Evaluation and Analysis Lab (H-SEAL), Applied Symbolic Computation Laboratory (ASYM), Security and Privacy Analytics Lab (SePAL), Software Engineering and Analytics Research (SOAR), Software Engineering Research Group (SERG), Social Computing Research Group, Vision and Cognition Laboratory (VisCog). For more information on these laboratories, please visit the College’s research web page (https://drexel.edu/cci/research/overview/).

Program Level Outcomes

The College of Computing & Informatics works continually to improve its degree programs. As part of this effort, the Information Systems degree is evaluated relative to the following Learning Objectives:

Graduates of the MS in Information Systems program are prepared to assume leadership and management positions designing, developing, and delivering innovative technological solutions to information problems in a variety of contexts. Their preparation encompasses the knowledge and abilities required to:

- Use a human-centered approach to analyze information needs and design solutions to meet those needs
- Lead or contribute substantially to a team in developing information technology products and services
- Evaluate, compare, and select from alternative and emerging information technologies
- Communicate with technical and non-technical audiences about information technology concepts and stakeholder needs

- Contribute substantially to an information technology plan for an organization
- Explain information technology uses, benefits, and ethical and global issues for individuals and organizations

Library and Information Science MSI

Major: Library and Information Science
Degree Awarded: Master of Science in Information (MSI)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: None
Classification of Instructional Programs (CIP) code: 25.0101
Standard Occupational Classification (SOC) code: 25-4021

About the Program

The Library and Information Science (LIS) graduate major integrates information technology, professional knowledge, and interdisciplinary, experiential learning to prepare our graduates to lead and innovate in libraries, archives, museums, and information organizations. The LIS graduate major in the MSI program is accredited by the American Library Association (ALA) since 1924 and is one of the one of the oldest continuously operating LIS graduate programs in North America.

Admission Requirements

The Master of Science in Information accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics (https://drexel.edu/cci/academics/masters-programs/ms-in-library-information-science/) website for more information on admission requirements.

Additional Information

For more information about this program, visit the College of Computing & Informatics MS in Information Library and Information Science (https://drexel.edu/cci/academics/masters-programs/ms-in-library-information-science/) webpage.

Tuition discounts up to 25% may be available (students must apply for discounts before the academic term begins). Other funding might also be available. For more information about funding options for the MSI library and information science program, visit the Scholarships for MSI library and information science students webpage (https://drexel.edu/cci/admissions/graduate-professional-development/graduate-funding/scholarships-for-msi-library-and-information-science-students/).

Degree Requirements

Core Courses		
INFO 501	Information Professionals, Resources, and Services	3.0
INFO 507	Leading and Managing Information Organizations	3.0
INFO 509	Information & Social Justice	3.0
INFO 590	Foundations of Data and Information	3.0
INFO 591	Data and Digital Stewardship	3.0
INFO 890	Capstone Project	3.0-6.0
Embedded Certificate		**12.0**
Choose 1 LIS certificate as an area of focus		
Archives and Curation		
Required Courses:		
INFO 560	Introduction to Archives I	
INFO 561	Introduction to Archives II	
Choose 2 electives from the following:		
INFO 750	Archival Access Systems	
INFO 755	Electronic Records Management	
INFO 756	Digital Preservation	
Metadata and Digital Technologies		
Required Courses:		
INFO 657	Digital Library Technologies	
INFO 662	Metadata and Resource Description	
Choose 2 electives from the following:		
INFO 547	Design Thinking for Digital Community Service	
INFO 552	Introduction to Web Design for Information Organizations	
INFO 660	Cataloging and Classification	
Users and Library Services		

Required Courses:		
INFO 652	Information Behavior	
INFO 687	Issues in Information Literacy	
Choose 2 electives from the following:		
INFO 649	Library Programming	
INFO 650	Public Library Service	
INFO 651	Academic Library Service	
INFO 665	Collection Management	
INFO 682	Storytelling	
INFO 683	Resources for Children	
INFO 684	Resources for Young Adults	
Electives		**12.0-15.0**
Student may use electives to add an additional LIS certificate or another CCI graduate certificate. Other graduate courses in CI, CS, CT, DSCI, INFO, and SE are also an option. Please consult your advisors for the option and course requirements.		
Total Credits		**45.0**

Sample Plan of Study

Part-time

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
INFO 501	3.0	INFO 507	3.0	INFO 509	3.0	VACATION	
INFO 590	3.0	INFO 591	3.0	Certificate/Elective	3.0		
	6		**6**		**6**		**0**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Certificate/Electives	6.0	Certificate/Electives	6.0	Certificate/Electives	6.0	VACATION	
	6		**6**		**6**		**0**

Third Year

Fall	Credits	Winter	Credits
Certificate/Electives	6.0	INFO 890	3.0
	6		**3**

Total Credits 45

Note: Third Year Winter is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Full-time

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
INFO 501	3.0	INFO 507	3.0	INFO 509	3.0	VACATION	
INFO 590	3.0	INFO 591	3.0	Certificate/Electives	6.0		
Certificate/Elective	3.0	Certificate/Elective	3.0				
	9		**9**		**9**		**0**

Second Year

Fall	Credits	Winter	Credits
Certificate/Electives	9.0	INFO 890	3.0
		Certificate/Electives	6.0
	9		**9**

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Program Level Outcomes

The College of Computing & Informatics works continually to improve its degree programs. As part of this effort, the Library and Information Science graduate major is evaluated relative to the following learning objectives:

Graduates of the LIS graduate major in the Master of Science in Information (MSI) degree program are prepared to assume leadership positions in designing, executing, and evaluating information services and products and in managing organizations that facilitate access to recorded knowledge. Their preparation enables them to gain the knowledge and abilities required to:

1. Professional Values and Ethical Foundations

1. 1. Analyze the social and technological contexts that shape the work of information professionals.
2. 2. Demonstrate commitment to core professional values, including social justice, intellectual freedom, and privacy.
3. 3. Evaluate and apply information policies, laws, and standards to support ethical technology use and equitable access to information and technology.

2. Organizational Leadership Management

1. 4. Lead and manage information organizations through equitable planning, budgeting, fundraising, and policy development.
2. 5. Use research and data to illustrate the value of libraries and information agencies and to support information and technology strategies.

3. Community Engagement and Service Design

1. 6. Assess the information needs of communities and design inclusive and accessible programs, resources, and services to address varied community needs.
2. 7. Develop and implement strategies to enhance information literacy for individuals and communities.

4. Information Stewardship and Digital Literacy

1. 8. Guide users in creating and managing digital identities and materials effectively.
2. 9. Sustainably appraise, organize, manage, and preserve digital and physical assets that are reflective of a diverse society, and help communities and individuals preserve their own identities and heritage.
3.

Software Engineering MSSE

Major: Software Engineering
Degree Awarded: Master of Science in Software Engineering (MSSE)
Calendar Type: Quarter
Minimum Required Credits: 45.0
Co-op Option: Available for full-time, on-campus master's-level students
Classification of Instructional Programs (CIP) code: 14.0903
Standard Occupational Classification (SOC) code: 15-1132; 15-1133

About the Program

The College of Computing & Informatics (https://drexel.edu/cci/)' Master of Science in Software Engineering (MSSE) program was created in response to the growing importance of software in modern society and the rapid rise in demand for professional software engineers.

The MS in Software Engineering program draws on the broad strengths of the College of Computing & Informatics to provide a curriculum that encompasses the behavioral, managerial, and technical aspects of software engineering. The program is appropriate for students interested in technical and managerial software work across a wide range of application domains, with the objective of transforming from developers to designers, architects, and technical leaders.

All students in the program take a core curriculum that provides a foundation spanning key software engineering topics and includes an integrative software studio experience. Students also take electives allowing them to specialize and gain in-depth knowledge according to their individual interests and career goals. The degree program culminates in a hands-on capstone experience (Software Studio) in which graduate students work for two to three quarters on an intensive team-based software project, with the goal of applying what they have learned to a real-world, ongoing project.

The program provides room for those with an insufficient computing background through completion of the Post-Baccalaureate Certificate in Computer Science Foundations (p. 54).

A graduate co-op is available; for more information, visit the Steinbright Career Development Center's website (https://drexel.edu/scdc/co-op/graduate/).

Admission Requirements

The Master of Science in Software Engineering accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/masters-programs/ms-in-software-engineering/) for more information on admission requirements.

Additional Information

For more information about this program, please visit the College of Computing & Informatics MS in Software Engineering webpage (https://drexel.edu/cci/academics/masters-programs/ms-in-software-engineering/).

Degree Requirements

Core Courses		
SE 570	Agile Software Development Process	3.0
SE 575	Software Design	3.0
SE 576	Software Reliability and Testing	3.0
SE 577	Software Architecture	3.0
SE 627	Requirements Engineering and Management	3.0
SE 638	Software Project Management	3.0
Major Specific Electives		**9.0**
Choose 3 courses from the following:		
CS 500	Fundamentals of Databases	
CS 590	Privacy	
CS 613	Machine Learning	
CS 645	Network Security	
CS 647	Distributed Systems Software	
SE 572	Web Services and Mobile Architectures	
SE 578	Security Engineering	
SE 610	Open Source Software Engineering	
SE 630	Software Engineering Economics	
Flexible Electives		**12.0**
Choose 4 additional courses, which may include:		
Any graduate-level course within the College (CI, CS, CT, DSCI, INFO, SE)		
Up to 6 credits of independent study		

Up to 6 credits of related graduate-level coursework outside of the College, with prior approval by the college		
Capstone Courses		
The capstone course should be taken twice for a total of 6 credits. Students may substitute 6 credits of thesis coursework if desired.		
SE 691	Software Studio	6.0
Optional Coop Experience		**0-1**
COOP 500	Career Management and Professional Development for Master's Degree Students *	
Total Credits		**45.0-46.0**

*

Co-op is an option for this degree for full-time on-campus students. To prepare for the 6-month co-op experience, students will complete: COOP 500. The total credits required for this degree with the co-op experience is 46.0.
Students not participating in the co-op experience will need 45.0 credits to graduate.

Sample Plan of Study

Part-time, no co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Core Courses	6.0	Core Courses	6.0	Core Course	3.0	Core Course	3.0
				Major Specific Elective	3.0	Major Specific Elective	3.0
	6		**6**		**6**		**6**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
Major Specific Elective	3.0	Flexible Elective	6.0	SE 691	3.0	SE 691	3.0
Flexible Elective	3.0			Flexible Elective	3.0		
	6		**6**		**6**		**3**

Total Credits 45

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Full-time, with co-op

First Year

Fall	Credits	Winter	Credits	Spring	Credits	Summer	Credits
COOP 500	1.0	Core Courses	6.0	Core Courses	6.0	Flexible Electives	6.0
Core Courses	6.0	Major Specific Electives	3.0	Major Specific Elective	3.0	SE 691	3.0
Major Specific Elective	3.0						
	10		**9**		**9**		**9**

Second Year

Fall	Credits	Winter	Credits	Spring	Credits
COOP EXPERIENCE		COOP EXPERIENCE		SE 691	3.0
				Flexible Elective	6.0
	0		**0**		**9**

Total Credits 46

Note: Second Year Summer is less than the 4.5-credit minimum required (considered half-time status) of graduate programs to be considered financial aid eligible. As a result, aid will not be disbursed to students this term.

Dual Degree Opportunities

Graduate students already enrolled in a master's degree program at Drexel have the opportunity, through the dual master's program, to work simultaneously on two CCI master's degrees and to receive both upon graduation. To be eligible, graduate students must be currently working on their first CCI master's degree when requesting admission to the second CCI master's degree. They must obtain approval from the graduate advisors of both programs and work out a plan of study encompassing coursework and/or research (thesis) credits for both degrees.

Some courses may be used to satisfy requirements in both degrees, reducing the total number of courses taken, according to Drexel’s Dual MS Degree Policy (https://drexel.edu/provost/policies-calendars/policies/dual-masters-degree/). The dual degree for MSSE students is only available to on-campus students. Please contact your advisor (https://drexel.edu/cci/current-students/graduate-professional-development/advising/) for more information on program requirements as some CCI master's degree combinations may require additional pre-requisites.

The dual master's student must complete the Change of Curriculum and Status form (https://drexel.edu/graduatecollege/forms-policies/forms/) and obtain approvals from both graduate advisors. Final approval is granted by the Graduate College (http://drexel.edu/graduatecollege/). The student is

then registered in both majors simultaneously. Upon graduation, the student must file two Application for Degree (https://drexel.edu/registrar/graduation/applying-for-degree/) forms.

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The CCI Commons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University’s network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Computer Support for Teaching

The CCI server room houses a multitude of servers to support faculty research, staff operations, and student learning. Services provided include a Linux compute cluster which is open to all faculty, staff, and students, multiple virtualization environments to meet different needs of faculty, staff, and students, and other single-purpose servers to support various operations throughout the college. The compute cluster provides a common environment for students to develop software, which makes testing easier for the TAs and faculty. Our virtualization environments allow college members the flexibility of a cloud environment with local support and direct cost recovery options. For those who need dedicated hardware, we also support dedicated research systems.

Classrooms are outfitted with laser projectors, 4K displays, class capture hardware, and the Wolfvision Cynap. The Cynap controls the AV distribution throughout the room and can display up to 4 streams simultaneously. These include the local PC, a laptop connected directly to the podium, or up to 4 streaming devices. Windows, macOS, iOS and Android devices can all connect wirelessly to the presentation system, allowing collaboration and freedom to roam the classroom for better interactivity. Wireless networking and outlets are also available for students throughout the classrooms. Laptops are available for checkout from the CCI Commons desk.

Additionally, CCI is hosting and supporting multiple Virtual Computing Lab environments for students to use that mimics the physical computer labs in CCI. This technology allows both online and face to face students to have the same experience when using computing facilities.

CCI Virtual Environments

CCI hosts a variety of virtual environments, which support all levels of research, academics, and administration at CCI. These include OpenStack, Proxmox VE, VMWare, and Xen architectures, backed by storage in CEPH. Multiple environments allow CCI IT to provide researchers with the level of control appropriate for the project at hand and make efficient use of project funding. External cloud vendors such as AWS and Google Cloud Platform are also used when appropriate.

CCI continues to invest in these virtual environments, and explores emerging environments, to continue to best support CCI research and teaching. CPU cores, storage, and memory are added at every opportunity to these flexible, scalable environments. The current capacity of the system includes:

- 1760 CPU Cores
- 6 TB of Memory
- Over 556 TB of HDD-backed storage
- 122 TB of high-performance SSD-backed storage
- 12 GPUs with room for expansion through funded research for high-performance computing needs

CCI Learning Center

The CCI Learning Center (CLC), located in 3675 Market Street's CCI Commons student computer lab, provides consulting and other learning resources for students taking courses offered by the Computer Science Department. The CLC is staffed by graduate and undergraduate computer science students from the College of Computing & Informatics.

The CLC and CCI Commons serve as a central hub for small group work, student meetings, and TA assistance.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, in 3675 Market Street including: the Metadata Research Center (MRC), Interactive Systems for Healthcare (IS4H) Research, Economics and Computation (EconCS), The TeX-Base Lab, SPiking And Recurrent SoftwarE (SPARSE) Coding, Human-System Evaluation and Analysis Lab (H-SEAL), Applied Symbolic Computation Laboratory (ASYM), Security and Privacy Analytics Lab (SePAL), Software Engineering and Analytics Research (SOAR), Software Engineering Research Group (SERG), Social Computing Research Group, Vision and Cognition Laboratory (VisCog). For more information on these laboratories, please visit the College’s research web page (https://drexel.edu/cci/research/overview/).

Program Level Outcomes

- Organize and manage software development teams and lead large-scale software projects.
- Effectively translate user requirements into software products.
- Apply design principles, patterns, and technologies to create and maintain software systems.
- Communicate and analyze software using models and state-of-the-art tools.
- Perform effective software quality assessment, technical debt calculation, effort estimation and prediction.
- Continue to learn throughout their career and to keep pace with changing technology as appropriate to their positions.

Graduate Minor in Computer Science

About the Graduate Minor

The graduate minor in Computer Science trains current Drexel graduate students, either in an MS or a PhD program in their home departments (other than the Computer Science Department), to obtain fundamental computer science knowledge. Additionally, the minor provides an introduction to advanced topics in computer science that are suitable for other fields of graduate study. The aim is to provide a systematic and efficient education to Drexel graduate students interested in expanding their studies through integration of computing including, but not limited to, rigorous algorithmic thinking and effective computational implementation without requiring prior computer science knowledge.

Program Requirements

Required Core Courses		
CS 501	Introduction to Programming	3.0
CS 502	Data Structures and Algorithms	3.0
CS 503	Systems Basics	3.0
CS 504	Introduction to Software Design	3.0
Elective Course		**3.0**
Complete one graduate-level (500+) Computer Science (CS) or Software Engineering (SE) course		
Total Credits		**15.0**

Additional Information

For more information about this program, visit the College of Computing & Informatics (https://drexel.edu/cci/academics/masters-programs/graduate-minors/)website.

Graduate Minor in Human-Computer Interaction and User Experience

About the Graduate Minor

The graduate minor in Human-Computer Interaction and User Experience offers Drexel graduate students in an MS or a PhD program the opportunity to learn a variety of foundational human-computer interaction (HCI) principles and applied user experience (UX) techniques. The program provides skills and training for students who wish to expand their understanding of human-centered design and/or apply design skills in their major area of study. The minor introduces a range of techniques for the design and evaluation of technologies that support and complement human needs and abilities in a broad range of contexts such as work, wellness, home, entertainment, and artistic expression.

Admission Requirements

Open to Drexel graduate students in an MS or a PhD program.

Additional Programs in Human-Computer Interaction and Information

For students who would like to further pursue graduate studies in the information field, CCI offers a Master of Science degree programs in Human-Computer Interaction & User Experience (https://drexel.edu/cci/academics/masters-programs/ms-in-information-human-computer-interaction-ux/) and Library & Information Science (https://drexel.edu/cci/academics/masters-programs/ms-in-library-information-science/) (ALA accredited).

Program Requirements

Required Courses		
INFO 508	Information Innovation through Design Thinking	3.0
INFO 690	Understanding Users: User Experience Research Methods	3.0
INFO 691	Prototyping the User Experience	3.0
Choose 2 of the following:		**6.0**
INFO 608	Human-Computer Interaction	
INFO 615	Designing with Data	
INFO 616	Social and Collaborative Computing	
Total Credits		**15.0**

Additional Information

For more information about this program, visit the College of Computing & Informatics (https://drexel.edu/cci/academics/masters-programs/graduate-minors/)website.

Post-Baccalaureate Certificate in Archives and Curation

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 25.0101
Standard Occupational Classification (SOC) Code: 25-4011

About the Program

The four-course Post-Baccalaureate Certificate in Archives and Curation responds to the rising demand for professionals who possess skills in archives and curation to work in government, academic, and corporate archives, libraries, and other repositories.

Graduates of Drexel CCI's PBC in Archives and Curation will be able to:

- Demonstrate skills in the acquisition, appraisal, arrangement and description, curation, reference, outreach, and technology in archives.
- Create, maintain, and evaluate archival access systems.
- Recognize legal, ethical, cultural, and political issues in historical and contemporary archival formats and standards.
- Select, organize, and access materials in trusted repositories in both technological and institutional settings.

This certificate is one of three leading to the MSI in Library and Information Science (https://catalog.drexel.edu/graduate/collegeofcomputingandinformatics/libraryandinformationscience/) or can be taken alone.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/) to learn more about admission requirements.

Program Requirements

Required Courses		
INFO 560	Introduction to Archives I	3.0
INFO 561	Introduction to Archives II	3.0
Elective Courses		**6.0**
Choose 2 from the following:		
INFO 750	Archival Access Systems	
INFO 755	Electronic Records Management	
INFO 756	Digital Preservation	
Total Credits		**12.0**

Sample Plan of Study

First Year (Part-Time)

Fall	Credits	Winter	Credits	Spring	Credits
INFO 560	3.0	INFO 561	3.0	Elective	3.0
		Elective	3.0		
	3		**6**		**3**

Total Credits 12

Additional Information

For more information about the Post-Baccalaureate Certificate program in Archives and Curation, please visit the the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Post-Baccalaureate Certificate in Big Data Analytics

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate

Number of Credits to Completion: 12.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 30.7001
Standard Occupational Classification (SOC) Code: 15-1111

About the Program

The post-baccalaureate certificate in Big Data Analytics provides students with big data analytics skills, including cloud computing, distributed computing, and natural language processing, as well as the opportunity of practicing their skills in capstone projects.

Admission Requirements

The post-baccalaureate certificate in Big Data Analytics accepts applicants who hold bachelor's degrees from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-big-data-analytics/) for more information on admission requirements.

Additional Information

For more information about this program, visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-big-data-analytics/).

Program Requirements

Required Courses		
DSCI 632	Applied Cloud Computing	3.0
INFO 623	Social Network Analytics	3.0
Choose 2 of the electives below		**6.0**
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 540	High Performance Computing	
CS 615	Deep Learning	
CS 647	Distributed Systems Software	
CS 660	Data Analysis at Scale	
CT 500	Introduction to the Digital Environment	
CT 600	Cloud Technology	
CT 605	Cloud Security and Virtual Environments	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 521	Data Analysis and Interpretation	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 605	Database Management Systems	
INFO 607	Applied Database Technologies	
Total Credits		**12.0**

Sample Plan of Study

First Year			
Fall	**Credits**	**Winter**	**Credits**
DSCI 632	3.0	INFO 623	3.0
Elective	3.0	Electives	3.0
	6		**6**
Total Credits 12			

Post-Baccalaureate Certificate in Computational Artificial Intelligence and Machine Learning

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online

Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0701
Standard Occupational Classification (SOC) Code: 15-0000

About the Program

The Post-Baccalaureate Certificate in Computational Artificial Intelligence and Machine Learning accepts applicants who hold Bachelor degrees in Computer Science, or have completed a Post-Baccalaureate Certificate in Computer Science Foundations (p. 54), and offers them opportunities to learn the computational elements of artificial intelligence and machine learning. The aim is to provide a strong foundation in this emerging area, with a focus on mathematical fundamentals, algorithms and real-world applications.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-computational-artificial-intelligence-machine-learning/) to learn more about admission requirements.

Additional Information

For more information about this program, please visit theCollege of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-computational-artificial-intelligence-machine-learning/).

Program Requirements

Required Courses		
CS 510	Introduction to Artificial Intelligence	3.0
CS 613	Machine Learning	3.0
CS 615	Deep Learning	3.0
Elective Course		**3.0**
Select one course from the following:		
CS 521	Data Structures and Algorithms I	
CS 525	Theory of Computation	
CS 583	Introduction to Computer Vision	
CS 589	Responsible Machine Learning	
CS 610	Advanced Artificial Intelligence	
CS 611	Game Artificial Intelligence	
CS 614	Applications of Machine Learning	
CS 616	Robust Deep Learning	
CS 618	Algorithmic Game Theory	
CS 630	Cognitive Systems	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 629	Applied Artificial Intelligence	
Total Credits		**12.0**

Sample Plan of Study

First Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
CS 510	3.0 Elective Course	3.0 CS 613	3.0 CS 615	3.0
	3	**3**	**3**	**3**

Total Credits 12

Post-Baccalaureate Certificate in Computer Security and Privacy

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0701

Standard Occupational Classification (SOC) Code: 15-1122

About the Program

The post-baccalaureate certificate in Computing Security and Privacy provides broad technical expertise in software security, network security, and computer privacy. It includes introductory courses in security engineering and computer privacy that cover key technical fundamentals. Electives provide additional in-depth expertise in operating systems, computer networks, and cryptography, which are essential bodies of knowledge for technical work in modern computer systems security.

Through this program, students will understand:

- the mathematics and algorithms underlying the foundations of security and privacy
- how software can be written to make it less vulnerable to exploits from adversaries
- how network security combined with cryptography and software security increase the safety and reliability of the Internet
- the role and importance of security and privacy to ensure that these features are addressed

Admission Requirements

The certificate in Computing Security and Privacy accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-computing-systems-security-privacy/) for more information on admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-computing-systems-security-privacy/).

Program Requirements

Required Courses		
CS 590	Privacy	3.0
CS 645	Network Security	3.0
SE 578	Security Engineering	3.0
Elective Course (choose 1)		**3.0**
CS 523	Cryptography	
CS 543	Operating Systems	
CS 544	Computer Networks	
CS 613	Machine Learning	
Consult departmental advisor for additional electives		
Total Credits		**12.0**

Sample Plan of Study

First Year			
Fall		**Credits Winter**	**Credits**
SE 578	3.0	CS 590	3.0
Elective	3.0	CS 645	3.0
	6		**6**
Total Credits 12			

Post-Baccalaureate Certificate in Computer Science Foundations

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0701
Standard Occupational Classification (SOC) Code: 11-3021

About the Program

The Post-Baccalaureate Certificate program in Computer Science Foundations accepts applicants who hold a bachelor's degree in areas other than computer science and offers them opportunities to learn the fundamentals of programming and theory in computer science. The aim is to provide an efficient and systematic education on the basics of computer science without any prerequisite computing education.

Through this program, students will gain the ability to:

- Analyze a problem and identify and define the computing requirements appropriate to its solution.
- Apply mathematical fundamentals, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- Design, implement, and evaluate a computer-based system, process, component, or program to meet desired computational needs.
- Apply sound software engineering principles in the construction of software systems of varying complexity.
- Understand the implementation and use of existing software tools and systems.

Admission Requirements

Please visit the College of Computing & Informatics#website(https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-computer-science-foundations/) to learn more about admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics#website(https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-computer-science-foundations/).

Program Requirements

Core Courses		
CS 501	Introduction to Programming	3.0
CS 502	Data Structures and Algorithms	3.0
CS 503	Systems Basics	3.0
CS 504	Introduction to Software Design	3.0
Total Credits		**12.0**

Sample Plan of Study

First Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
CS 501	3.0 CS 502	3.0 CS 503	3.0 CS 504	3.0
	3	**3**	**3**	**3**

Total Credits 12

Post-Baccalaureate Certificate in Computer Science Theory & Practice

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0701
Standard Occupational Classification (SOC) Code: 11-3021, 15-1111; 15-1131; 15-1132; 15-1199

About the Program

The Post-Baccalaureate Certificate in Computer Science Theory & Practice covers core theoretical and practical concepts needed for computing, and prepares students to work with computational and algorithmic methods across a wide range of potential fields and applications. This is a core certificate intended to provide the key theoretical and practical underpinnings of computer science.

Through this program, students will be able to:

- Understand the theoretical and practical core concepts of computer science
- Utilize modern computational methods to analyze and build computational systems
- Select, use, adapt, and explain appropriate computational and algorithmic solutions to a range of real-world problems

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/) to learn more about admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Program Requirements

Choose 4 courses below, each from a different category, including 1 course from the Theory category		12.0
Theory		
CS 521	Data Structures and Algorithms I	
CS 525	Theory of Computation	
Computer Systems		
CS 543	Operating Systems	
CS 544	Computer Networks	
Intelligent Systems		
CS 510	Introduction to Artificial Intelligence	
CS 613	Machine Learning	
Programming Systems		
CS 550	Programming Languages	
SE 575	Software Design	
Applications		
CS 500	Fundamentals of Databases	
CS 523	Cryptography	
CS 530	Developing User Interfaces	
CS 536	Computer Graphics	
CS 540	High Performance Computing	
CS 558	Game Engine Programming	
CS 567	Applied Symbolic Computation	
CS 583	Introduction to Computer Vision	
CS 590	Privacy	
SE 578	Security Engineering	
Total Credits		**12.0**

Sample Plan of Study

First Year

Fall	Credits	Winter	Credits
CS 521 or 525	3.0	Required Category Course 2	3.0
Required Category Course 1	3.0	Required Category Course 3	3.0
	6		**6**

Total Credits 12

Post-Baccalaureate Certificate in Data Science Foundations

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 30.7001
Standard Occupational Classification (SOC) Code: 15-1111

About the Program

The#post-baccalaureate certificate in Data Science Foundations provides students with knowledge of fundamental data science concepts and techniques. Students hone their programming skills and learn to use industry-standard tools for data representation, processing, analysis, and interpretation. Elective courses cover diverse aspects of data science ranging from policy and ethics to specialized analytic techniques that can help students develop their ability to derive insights from diverse types of data.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/introduction-to-data-science-graduate-certificate/) to learn more about admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/introduction-to-data-science-graduate-certificate/).

Program Requirements

Required Courses		
DSCI 511	Data Acquisition and Pre-Processing	3.0
DSCI 521	Data Analysis and Interpretation	3.0
Choose 2 of the electives below		**6.0**
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 503	Systems Basics	
CS 504	Introduction to Software Design	
DSCI 501	Quantitative Foundations of Data Science	
INFO 590	Foundations of Data and Information	
INFO 605	Database Management Systems	
INFO 620	Information Systems Analysis and Design	
INFO 633	Information Visualization	
INFO 659	Introduction to Data Analytics	
INFO 725	Information Policy and Ethics	
Total Credits		**12.0**

Sample Plan of Study

First Year			
Fall		**Credits Winter**	**Credits**
DSCI 511	3.0	DSCI 521	3.0
Elective	3.0	Elective	3.0
	6		**6**
Total Credits 12			

Post-Baccalaureate Certificate in Digital Transformation

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 15.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 52.0216
Standard Occupational Classification (SOC) Code: 11-9199

About the Program

The interdisciplinary post-baccalaureate certificate program in Digital Transformation, jointly offered by the LeBow College of Business and College of Computing & Informatics, prepares students to understand and work with technologies that are reshaping the way contemporary businesses

operate and compete. Courses provide fundamental knowledge of the technological landscape, business applications, management, and strategic considerations.

This certificate can be combined with other certificates to create the Master of Science in Business Information Technology (MSBIT). Please see the College of Computing & Informatics' website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-digital-transformation/) for more information.

Admission Requirements

The program is designed for students who have either a technical or business bachelor's degree from an accredited university with relevant work experience.

Additional Information

For more information please contact our Graduate Student Services department at lebowgradenroll@drexel.edu or the College of Computing & Informatics at cciinfo@drexel.edu.

Program Requirements

MGMT 602	Innovation Management	3.0
MGMT 603	Technology Strategy	3.0
MIS 642	Emerging Information Technologies in Business	3.0
MIS 643	Digital Platform Management	3.0
MIS 653	Design Thinking for Digital Innovations	3.0
Total Credits		**15.0**

Sample Plan of Study

First Year

Fall	Credits	Winter	Credits
MIS 642	3.0	MIS 643	3.0
MGMT 602	3.0	MIS 653	3.0
		MGMT 603	3.0
	6		**9**

Total Credits 15

Post-Baccalaureate Certificate in Human-Computer Interaction and User Experience Research and Design

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online, Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 30.3101
Standard Occupational Classification (SOC) Code: 15-1120

About the Program

The post-baccalaureate certificate program in Human-Computer Interaction and User Experience Research and Design provides foundational, practical skills for professionals who want to design and evaluate a wide variety of user experiences and computer interfaces. This certificate prepares students to use design as a problem-solving methodology to address challenges in a variety of professional domains. Through a series of foundational courses, students become proficient with a range of industry-standard design tools and research methods.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/) to learn more about admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Program Requirements

INFO 508	Information Innovation through Design Thinking	3.0
or DSRE 620	Design Problem Solving	
INFO 690	Understanding Users: User Experience Research Methods	3.0
INFO 691	Prototyping the User Experience	3.0
INFO 615	Designing with Data	3.0
Total Credits		**12.0**

Sample Plan of Study

First Year

Fall	Credits Winter	Credits Spring	Credits Summer	Credits
INFO 508	3.0 INFO 690	3.0 INFO 691	3.0 INFO 615	3.0
	3	**3**	**3**	**3**

Total Credits 12

Post-Baccalaureate Certificate in Human-Computer Interaction and User Experience Theory & Frontiers

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online, Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 30.3101
Standard Occupational Classification (SOC) Code: 15-1210

About the Program

The Post-Baccalaureate Certificate in HCI/UX Theory and Frontiers prepares students to work with novel interaction paradigms and specialized HCI/UX skill sets and populations, and to engage with advanced theoretical underpinnings of Human-Computer Interaction and User Experience.# Coursework in the Theory and Frontiers certificate both introduces the theoretical and practical foundations of the field and challenges students to expand on and extend user experience design and evaluation techniques to new kinds of use contexts and design problems.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/) to learn more about admission requirements.

Additional Information

To learn more about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Program Requirements

INFO 608	Human-Computer Interaction	3.0
INFO 609	Accessible and Inclusive Design	3.0
INFO 616	Social and Collaborative Computing	3.0
INFO 693	Human–Artificial Intelligence Interaction	3.0
Total Credits		**12.0**

Sample Plan of Study

First Year			
Fall		**Credits Winter**	**Credits**
INFO 608		3.0 INFO 609	3.0
INFO 693		3.0 INFO 616	3.0
		6	**6**

Total Credits 12

Post-Baccalaureate Certificate in Information Systems

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 15.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0101
Standard Occupational Classification (SOC) Code: 11-2031

About the Program

The Post-Baccalaureate Certificate in Information Systems prepares students to apply and manage information systems to solve organizational problems.##Courses in this certificate provide foundational skills and knowledge that introduce the many areas of expertise necessary for a career in Information Systems; for example, cybersecurity, human-centered systems evaluation and design, database fundamentals, design documentation, and a broad understanding of how information systems support organizations and individuals.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/) to learn more about admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Program Requirements

INFO 517	Principles of Cybersecurity	3.0
INFO 540	Perspectives on Information Systems	3.0
INFO 605	Database Management Systems	3.0
INFO 608	Human-Computer Interaction	3.0
INFO 620	Information Systems Analysis and Design	3.0
Total Credits		**15.0**

Sample Plan of Study

First Year			
Fall	**Credits Winter**	**Credits Spring**	**Credits**
INFO 517	3.0 INFO 605	3.0 INFO 620	3.0
INFO 540	3.0 INFO 608	3.0	
	6	**6**	**3**

Total Credits 15

Post-Baccalaureate Certificate in Information Systems Development

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 15.0
Instructional Delivery: Online; Campus

Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not Aid eligible
Classification of Instructional Program (CIP) Code: 52.1206
Standard Occupational Classification (SOC) Code: 25-1021

About the Program

The interdisciplinary post-baccalaureate certificate program in Information Systems Development, jointly offered by the LeBow College of Business and College of Computing & Informatics, enables students to analyze, design, and deploy information systems to meet world-class standards and align with contemporary business goals. Courses cover business agility, database management, and the latest approaches to development of information systems and application software. Courses provide both practical technical and business knowledge.

This certificate can be combined with other certificates to create the Master of Science in Business Information Technology (MSBIT). Please see the College of Computing & Informatics' website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-information-systems-development/) for more information.

Admission Requirements

The program is designed for students who have either a technical or business bachelor's degree from an accredited university with relevant work experience.

Additional Information

For more information please contact our Graduate Student Services department at lebowgradenroll@drexel.edu or the College of Computing & Informatics at cciinfo@drexel.edu.

Program Requirements

CT 630	Application Software Construction and Operation	3.0
INFO 540	Perspectives on Information Systems	3.0
INFO 605	Database Management Systems	3.0
MIS 624	Systems Analysis & Design	3.0
MIS 652	Business Agility and IT	3.0

Sample Plan of Study

First Year

Fall	Credits	Winter	Credits
INFO 540	3.0	CT 630	3.0
MIS 624	3.0	INFO 605	3.0
		MIS 652	3.0
	6		**9**

Total Credits 15

Post-Baccalaureate Certificate in Information Technology and Management

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 15.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 52.1206
Standard Occupational Classification (SOC) Code: 25-1021

About the Program

The interdisciplinary post-baccalaureate certificate program in Information Technology and Management, jointly offered by the LeBow College of Business and College of Computing & Informatics, provides a comprehensive understanding of the business applications and management of

information technology. Students gain expertise in the contemporary digital environment, cloud technology, alignment of operations, risk assessment, and continuity planning.

This certificate can be combined with other certificates to create the Master of Science in Business Information Technology (MSBIT). Please see the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-information-technology-management/) for more information.

Admission Requirements

The program is designed for students who have either a technical or business bachelor's degree from an accredited university with relevant work experience.

Additional Information

For more information please contact our Graduate Student Services department at lebowgradenroll@drexel.edu or the College of Computing & Informatics at cciinfo@drexel.edu.

Program Requirements

CT 500	Introduction to the Digital Environment	3.0
CT 600	Cloud Technology	3.0
CT 610	Disaster Recovery, Continuity Planning and Digital Risk Assessment	3.0
MIS 615	Aligning Information Technologies and Operations	3.0
MIS 625	Management of Information Technology Operations	3.0
Total Credits		**15.0**

Sample Plan of Study

First Year

Fall	Credits	Winter	Credits
CT 500	3.0	CT 600	3.0
MIS 615	3.0	CT 610	3.0
		MIS 625	3.0
	6		**9**

Total Credits 15

Post-Baccalaureate Certificate in Information Technology Strategy & Execution

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 15.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 52.1206
Standard Occupational Classification (SOC) Code: 25-1021

About the Program

The interdisciplinary post-baccalaureate certificate program in Information Technology Strategy & Execution, jointly offered by the LeBow College of Business and College of Computing & Informatics, is designed to train the next generation of digital strategists. Students learn to evaluate and manage technology projects, lead change, and ensure alignment between a firm's technology and business strategy.

This certificate can be combined with other certificates to create the Master of Science in Business Information Technology (MSBIT). Please see the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-information-technology-strategy-execution/) for more information.

Admission Requirements

The program is designed for students who have either a technical or business bachelor's degree from an accredited university with relevant work experience

Additional Information

For more information please contact our Graduate Student Services department at lebowgradenroll@drexel.edu or the College of Computing & Informatics at cciinfo@drexel.edu.

Program Requirements

MIS 612	Aligning Information Systems and Business Strategies	3.0
MIS 641	MIS Policy and Strategy	3.0
ORGB 602	Leading and Executing Change	3.0
SE 630	Software Engineering Economics	3.0
SE 638	Software Project Management	3.0
Total Credits		**15.0**

Sample Plan of Study

First Year			
Fall	**Credits**	**Winter**	**Credits**
MIS 612	3.0	MIS 641	3.0
SE 630	3.0	ORGB 602	3.0
		SE 638	3.0
	6		**9**

Total Credits 15

Post-Baccalaureate Certificate in Machine Learning for Data Science

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online, Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 30.7001
Standard Occupational Classification (SOC) Code: 15-1132

About the Program

The Machine Learning for Data Science certificate program provides students with knowledge of advanced approaches to data analysis. Courses in this certificate equip students with an understanding of theoretical foundations as well as practical techniques associated with machine learning and related topics like recommender systems, deep learning, and natural language processing.

Admission Requirements

The post-baccalaureate certificate in Machine Learning for Data Science accepts applicants who hold bachelor's degrees from an accredited university and offers them an opportunity to learn a variety of foundational and applied data science topics. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/) to learn more about admission requirements.

Additional Information

For more information about this program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Program Requirements

Required Core Courses		
DSCI 631	Applied Machine Learning for Data Science	3.0
DSCI 641	Recommender Systems for Data Science	3.0
Elective Courses		**6.0**
Choose 2 courses from the following:		
CS 570	Programming Foundations	
or CS 501	Introduction to Programming	
CS 502	Data Structures and Algorithms	
CS 583	Introduction to Computer Vision	

CS 613	Machine Learning	
CS 614	Applications of Machine Learning	
CS 615	Deep Learning	
DSCI 501	Quantitative Foundations of Data Science	
DSCI 521	Data Analysis and Interpretation	
DSCI 691	Natural Language Processing with Deep Learning	
INFO 623	Social Network Analytics	
Total Credits		**12.0**

Sample Plan of Study

First Year			
Fall	**Credits**	**Winter**	**Credits**
DSCI 631	3.0	DSCI 641	3.0
Elective	3.0	Elective	3.0
	6		**6**
Total Credits 12			

Post-Baccalaureate Certificate in Metadata and Digital Technologies

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online, Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 25.0101
Standard Occupational Classification (SOC) Code: 25-4000

About the Program

The four-course Post-Baccalaureate Certificate in Metadata and Digital Technologies, drawing on the College of Computing & Informatics' expertise in both technology and metadata, prepares students to work with digital technologies for the organization, categorization and retrieval of digital sources.

Graduates of Drexel CCI's PBC in Metadata and Digital Technology will be able to:

- Develop specialized metadata schemes for resource description and discovery in digital repositories.
- Apply information architecture theories and practices to web development for libraries, museums, archives, and other information organizations.
- Demonstrate skills and trends in current and emerging digital library technologies.
- Articulate the needs and strategies for information organizations to store, curate, and preserve data and information for the purpose of providing information service to communities.

This certificate is one of three leading to the MSI in Library and Information Science (https://catalog.drexel.edu/graduate/collegeofcomputingandinformatics/libraryandinformationscience/) or can be taken alone.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/admissions/masters-certificate/) to learn more about admission requirements.

Program Requirements

Required Courses		
INFO 657	Digital Library Technologies *	3.0
INFO 662	Metadata and Resource Description	3.0
Elective Courses		**6.0**
Choose 2 of the following		
INFO 547	Design Thinking for Digital Community Service	
INFO 552	Introduction to Web Design for Information Organizations	
INFO 660	Cataloging and Classification	
Total Credits		**12.0**

*

INFO 657 has a prerequisite of INFO 552, or INFO 540 or INFO 590. Students with sufficient technical background may be eligible for a prerequisite waiver. Students needing the prerequisite may fulfill this by taking INFO 552 as an elective for this certificate, or by completing one of the prerequisite courses in fulfillment of a requirement for a master's degree or another certificate.

Sample Plan of Study

First Year (Part-Time)

Fall	Credits Winter	Credits Spring	Credits Summer	Credits
INFO 662	3.0 Elective	3.0 Elective	3.0 INFO 657*	3.0
	3	**3**	**3**	**3**

Total Credits 12

*

INFO 657 has a prerequisite of INFO 552, or INFO 540, or INFO 590. Students with sufficient technical background may be eligible for a prerequisite waiver. Students needing the prerequisite may fulfill this by taking INFO 552 as an elective for this certificate, or by completing one of the prerequisite courses in fulfillment of a requirement for a master's degree or another certificate.

Additional Information

For more information about the Post-Baccalaureate Certificate program in Metadata and Digital Technologies, please visit the the College of Computing & Informatics website (https://drexel.edu/cci/).

Post-Baccalaureate Certificate in Organizational Security

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 15.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0103
Standard Occupational Classification (SOC) Code: 15-1121;15-1122

About the Program

The post-baccalaureate certificate in Organizational Security provides broad knowledge on securing the business information infrastructure, cloud security, security policy, assurance, and forensics. Courses provide both practical technical and business knowledge.

This certificate can be combined with other certificates to create the Master of Science in Business Information Technology (MSBIT). Please see the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-organizational-security/) for more information.

Admission Requirements

The program is designed for students who have either a technical or business bachelor’s degree from an accredited university with relevant work experience.

Additional Information

For more information about this program, visit the College of Computing & Informatics website. (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-organizational-security/)

Program Requirements

CT 605	Cloud Security and Virtual Environments	3.0
CT 620	Security, Policy and Governance	3.0
INFO 517	Principles of Cybersecurity	3.0
INFO 710	Information Forensics	3.0
INFO 712	Information Assurance	3.0
Total Credits		**15.0**

Sample Plan of Study

First Year			
Fall	**Credits**	**Winter**	**Credits**
CT 620	3.0	CT 605	3.0
INFO 517	3.0	INFO 710	3.0
		INFO 712	3.0
	6		**9**
Total Credits 15			

Post-Baccalaureate Certificate in Software Architecture

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online; Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 14.0903
Standard Occupational Classification (SOC) Code: 15-1133

About the Program

Software architecture is the primary carrier of system qualities, such as performance, reliability, modifiability, and security. Architecture helps ensure that a design approach will yield an acceptable system and holds the key to maintenance and sustainment efforts, ensures critical quality attributes, and holds every phase of a project together. A software architect needs to build comprehensive knowledge and skills and be prepared to fulfill extensive duties beyond programming. This certificate equips software professionals with state-of-the-art practices for designing, analyzing, documenting, and implementing software architectures.

Admission Requirements

The certificate in Software Architecture accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-software-architecture/) for more information on admission requirements.

Additional Information

For more information about this program, visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-software-architecture/).

Program Requirements

Required Courses		
SE 570	Agile Software Development Process	3.0
SE 575	Software Design	3.0
SE 577	Software Architecture	3.0
Elective course		**3.0**
Choose 1 course from the following		
CS 500	Fundamentals of Databases	
CS 590	Privacy	
CS 645	Network Security	
CS 647	Distributed Systems Software	
SE 572	Web Services and Mobile Architectures	
SE 576	Software Reliability and Testing	
SE 578	Security Engineering	
SE 610	Open Source Software Engineering	
Total Credits		**12.0**

Sample Plan of Study

First Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
SE 575	3.0 Elective Course	3.0 SE 577	3.0 SE 570	3.0
	3	**3**	**3**	**3**

Total Credits 12

Post-Baccalaureate Certificate in Software Management

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 14.0903
Standard Occupational Classification (SOC) Code: 11-9041

About the Program

Software management is a complex endeavor requiring an understanding of software engineering technology combined with general management skills. This certificate is designed for software engineers preparing for or already in a management role. The certificate advances capabilities including requirements engineering, communicating with stakeholders, and managing time, budget, and personnel for software engineering projects.

Admission Requirements

The certificate in Software Management accepts applicants who hold a bachelor's degree from an accredited university. Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-software-management/) for more information on admission requirements.

Additional Information

For more information about this program, visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-software-management/).

Program Requirements

Required Courses		
SE 627	Requirements Engineering and Management	3.0
SE 630	Software Engineering Economics	3.0
SE 638	Software Project Management	3.0
Elective Course		**3.0**
Choose 1 course from the following:		
CS 500	Fundamentals of Databases	
CS 502	Data Structures and Algorithms	
CS 590	Privacy	
INFO 605	Database Management Systems	
INFO 608	Human-Computer Interaction	
INFO 620	Information Systems Analysis and Design	
INFO 646	Information Systems Management	
SE 576	Software Reliability and Testing	
SE 578	Security Engineering	
SE 610	Open Source Software Engineering	
Total Credits		**12.0**

Sample Plan of Study

First Year				
Fall	**Credits Winter**	**Credits Spring**	**Credits Summer**	**Credits**
SE 627	3.0 Elective	3.0 SE 630	3.0 SE 638	3.0
	3	**3**	**3**	**3**

Total Credits 12

Post-Baccalaureate Certificate in Users and Library Services

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online, Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 25.0101
Standard Occupational Classification (SOC) Code: 25.4002

About the Program

The Post-Baccalaureate Certificate in Users and Library Services focuses on understanding how people search for and use information and information technologies and how these concepts manifest themselves in library service design.

Required courses in the Users and Library Services Certificate focus on understanding information literacy as it plays out across different types of information media and learning how different groups of people search for and use information.

Graduates of Drexel CCI's Post-Baccalaureate Certificate in Users and Library Services will be able to:

- Describe how diverse groups of people seek and use information in a variety of contexts.
- Analyze current issues in information literacy, including information evaluation, perspective, and bias.
- Explain current trends in library and information services.

This certificate is one of three leading to the MSI in Library and Information Science (https://catalog.drexel.edu/graduate/collegeofcomputingandinformatics/libraryandinformationscience/) or can be taken alone.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/) to learn more about admission requirements.

Additional Information

For more information about the Post-Baccalaureate Certificate program in Users and Library Services, please visit the the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-users-and-library-services/).

Program Requirements

Required Courses		
INFO 652	Information Behavior	3.0
INFO 687	Issues in Information Literacy	3.0
Elective Courses		**6.0**
Choose 2 of the following		
INFO 649	Library Programming	
INFO 650	Public Library Service	
INFO 651	Academic Library Service	
INFO 665	Collection Management	
INFO 682	Storytelling	
INFO 683	Resources for Children	
INFO 684	Resources for Young Adults	
Total Credits		**12.0**

Sample Plan of Study

First Year (Part-Time)

Fall	Credits	Winter	Credits	Spring	Credits
INFO 687	3.0	INFO 652	3.0	Elective	3.0
		Elective	3.0		
	3		**6**		**3**

Total Credits 12

Post-Baccalaureate Certificate in Web Application Development

Certificate Level: Graduate
Admission Requirements: Bachelor's degree
Certificate Type: Post-Baccalaureate
Number of Credits to Completion: 12.0
Instructional Delivery: Online, Campus
Calendar Type: Quarter
Expected Time to Completion: 1 year
Financial Aid Eligibility: Not aid eligible
Classification of Instructional Program (CIP) Code: 11.0101
Standard Occupational Classification (SOC) Code: 11-3021

About the Program

The Post-Baccalaureate Certificate in Web Application Development introduces the technical and managerial skills necessary to develop web applications that meet the needs of organizations, groups, and individuals.

Admission Requirements

Please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/graduate-certificate-in-web-application-development/) to learn more about admission requirements.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics website (https://drexel.edu/cci/academics/certificate-programs/).

Program Requirements

INFO 532	Software Development	3.0
INFO 600	Web Systems & Architecture	3.0
INFO 655	Intro to Web Programming	3.0
Choose 2 of the following:		6.0
INFO 670	Cross-platform Mobile Development	
SE 627	Requirements Engineering and Management	
SE 638	Software Project Management	
Total Credits		**15.0**

Sample Plan of Study

First Year

Fall	Credits	Winter	Credits	Spring	Credits
INFO 532	3.0	INFO 600	3.0	Electives	6.0
		INFO 655	3.0		
	3		**6**		**6**

Total Credits 15

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